MAINTENANCE MANUAL

SUPER TURBO-X 48 Mk III
SUPER TURBO-X 510 Mk III
SUPER TURBO-X 612 Mk III

(1.8 kW/2.5 kW/4 kW Laser Specification)

MANUAL No.: H676MA0033E

NC Equipment: MAZATROL PREVIEW

Serial No.:

Before using this machine and equipment, fully understand the contents of this manual to ensure proper operation. Should any questions arise, please ask the nearest Technical Center or Technology Center.

IMPORTANT NOTICE

1. **Be sure to observe the safety precautions described in this manual and the contents of the safety plates on the machine and equipment. Failure may cause serious personal injury or material damage. Please replace any missing safety plates as soon as possible.**
2. **No modifications are to be performed that will affect operation safety. If such modifications are required, please contact the nearest Technical Center or Technology Center.**
3. **For the purpose of explaining the operation of the machine and equipment, some illustrations may not include safety features such as covers, doors, etc. Before operation, make sure all such items are in place.**
4. **This manual was considered complete and accurate at the time of publication, however, due to our desire to constantly improve the quality and specification of all our products, it is subject to change or modification. If you have any questions, please contact the nearest Technical Center or Technology Center.**
5. **Always keep this manual near the machinery for immediate use.**
6. **If a new manual is required, please order from the nearest Technical Center or Technology Center with the manual No. or the machine name, serial No. and manual name.**

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05. 2011

CAUTION

- To maintain the high performance and high-accuracy processing of the laser machine, the level of the machine and its laser optical systems must be kept stable.
  Accordingly, a foundation must be built to the foundation plan supplied by Mazak, or the machine must be installed on a floor which is approved as meeting our design requirements.
  If the machine is installed on a floor or foundation which does not meet Mazak design requirements and a problem arises due to improper installation, free services may be denied even within the guaranteed period.
- The laser processing performance values specified in the catalogs and manuals (operating manual and maintenance manual) are for reference purposes only and they are not the values which Mazak guarantees. These values are obtained only under the conditions (material, gas, processing conditions, etc.) in which the machine is installed in a Mazak plant and when the machine is properly maintained according to the instructions specified in the maintenance manual.

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- NOTE -

1 INTRODUCTION

This manual describes the machine(s) specified in the title of this manual.

In this manual, machine model names are expressed using the abbreviation specified in the table below.

Model Name	Abbreviation
SUPER TURBO-X 48 Mk III	ST-X48 MkIII
SUPER TURBO-X 510 Mk III	ST-X510 MkIII
SUPER TURBO-X 612 Mk III	ST-X612 MkIII

1-1 Machine Outline

1-1-1 Characteristic and intended use of the machine

The SUPER TURBO-X Mk III is a two-dimensional laser cutting machine designed in pursuit of high speed and high productivity. This machine is designed to have high rigidity, high cutting performance, high accuracy, high accuracy retaining ability, and thus very high reliability. In addition, it has an extremely high machining performance and is provided with various functions that improve its operability and reduce its setup time. This machine can respond to a wide range of needs for highly efficient cutting, hole machining, etc. of parts in various industries, such as air conditioning, signboard, general sheet metal, automotive sheet metal, aircraft, steel frame, bridge construction, shipbuilding, semi-conductor, and liquid crystal industries.

1-1-2 Operating positions

The machine is designed to be operated in the diagonally shaded areas in the figure below.

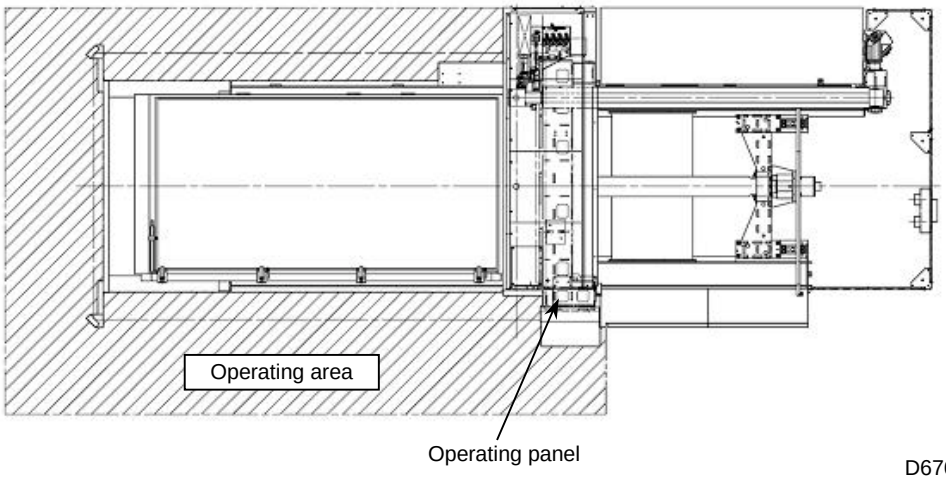


Fig. 1-1 Operating area for ST-X MkIII STD

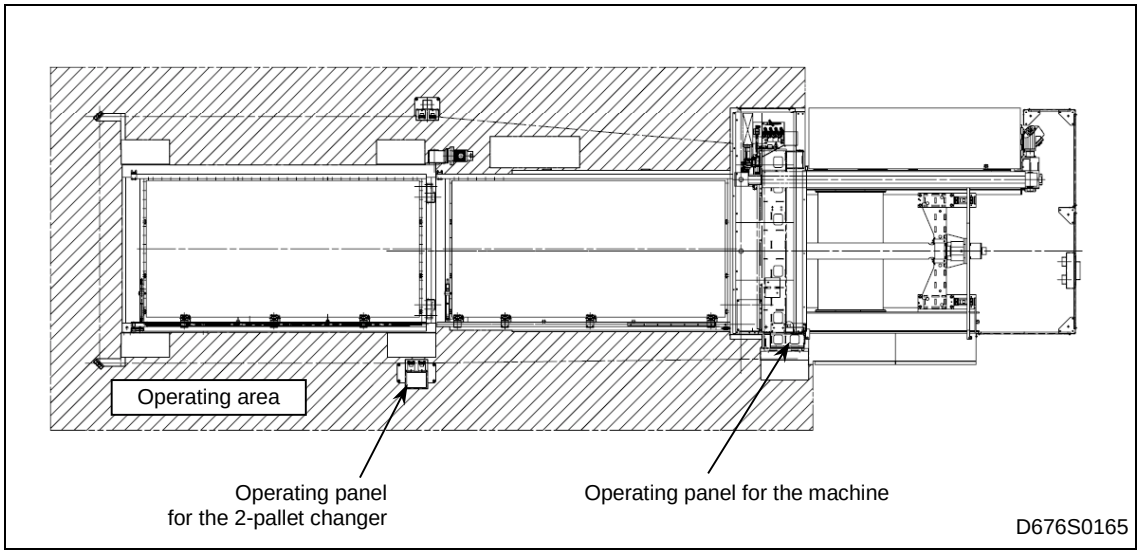


Fig. 1-2 Operating area for ST-X MkIII with 2-pallet changer

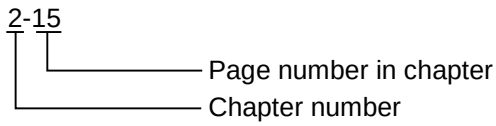
1-2 List of Manuals to Be Used

For this machine, the following manuals are provided.

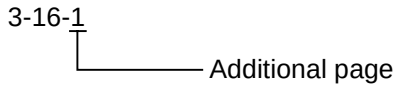
Manual name	Coverage
Operating manual	General information on operation and handling
Maintenance manual	General maintenance information including inspection and adjustment procedures
Programming manual	Information on CNC programming
Parts list	Details of the parts
Electrical wiring diagrams	Electrical connections
Operating manual for INTELLIGENT LOOP SYSTEM	Information on operation and handling for intelligent functions
Intelligent programming manual	

1-3 Numbering System for Pages

1. Normal case



2. For additional pages to be inserted



1-4 Numbering System for Figures and Tables

1. Figure number

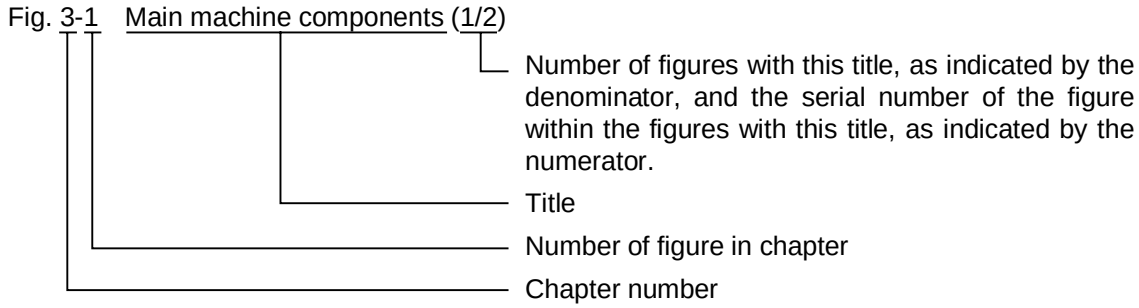
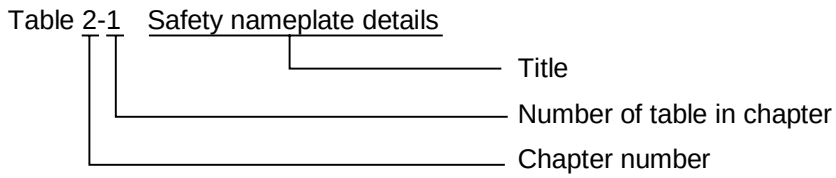


Fig. 3-1 Main machine components (1/2)
Number of figures with this title, as indicated by the denominator, and the serial number of the figure within the figures with this title, as indicated by the numerator.
Title
Number of figure in chapter
Chapter number

2. Table number



- NOTE -

2 SAFETY PRECAUTIONS

2-1 FDA Compliance with 21 CFR 1040.10 and 1040.11

The Mazak laser machine meets the requirements for the “Center for Devices and Radiological Health of Food and Drug Administration for Laser Products”.
FDA: Food and Drug Administration for the U.S.A.

2-1-1 Protective housing

1. Class 1 systems

The laser oscillator and external beam delivery system is enclosed by metallic covers and the work station is completely enclosed by clear acrylic covers to prevent any access to laser radiation during operation and maintenance.

WARNING

- In adjusting the focusing torch during manual operation, you may be endangered to expose yourself to the laser beam near the table. In such an operation wear protective goggles. Persons other than a concerned one are prohibited to enter the vicinity of the table. A focus adjusting operator must be qualified by Yamazaki Mazak Corporation.

2-1-2 Safety interlocks

1. Class 1 systems

Oscillator and power supply unit covers have non-defeatable interlock switches. When the cover is removed the high voltage will automatically turn off. The work station door has interlocks, so the door must be closed for the machine to operate. If the door is opened during operation, the laser beam shutter will automatically close and the machine will stop and an alarm will occur.

2-1-3 Master key switch

1. Class 1 systems

A key switch on the control board is the master control switch. The key is removable in the “OFF” position and the laser will not be operational when the key is removed. One person should be responsible for the key.

2-1-4 Remote control connector

The remote control connector is provided so that the user can connect to a remote barrier interlock, emergency stop switch or similar device. Generally, the connector is short-circuited. When the connector is opened, the beam shutter will close, the machine will stop and an alarm will occur (please see the maintenance manual for details).

2-1-5 Manual reset function

To reset the Remote Control Interlock, push the NC reset key.

2-1-6 Emission indicator

The yellow light on top of the NC control is an emission indicator. This light will blink when the high voltage switch is tripped. Then laser discharge inside the oscillator will begin.

2-1-7 Beam attenuator

1. Class 1 systems

An electrically actuated shutter provides a means of preventing access to laser output radiation without turning off the main power. The beam shutter can be controlled by NC commands during automatic operation or can be controlled by the key switch in the manual mode.

2-1-8 Labeling

1. Class 1 systems

The following labels and diagram define the meaning and location of the protective safety labels for your machine. Please study these labels and locate them on the machine in your place of business.

Certification and identification label

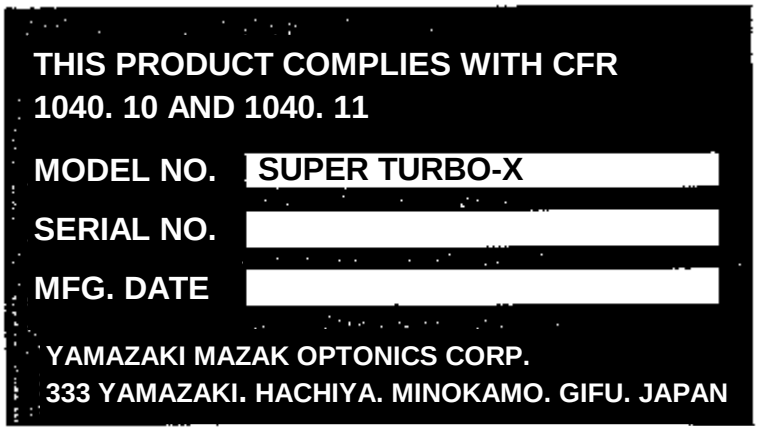


Fig. 2-1 Certification and identification label

Warning, logotype B (Class 4 systems only)

Fig. 2-2 1.8 kW CO_2 laser system

Fig. 2-3 2.5 kW CO_2 laser system

Fig. 2-4 4 kW CO_2 laser system

2. Aperture label located on the Z-axis head

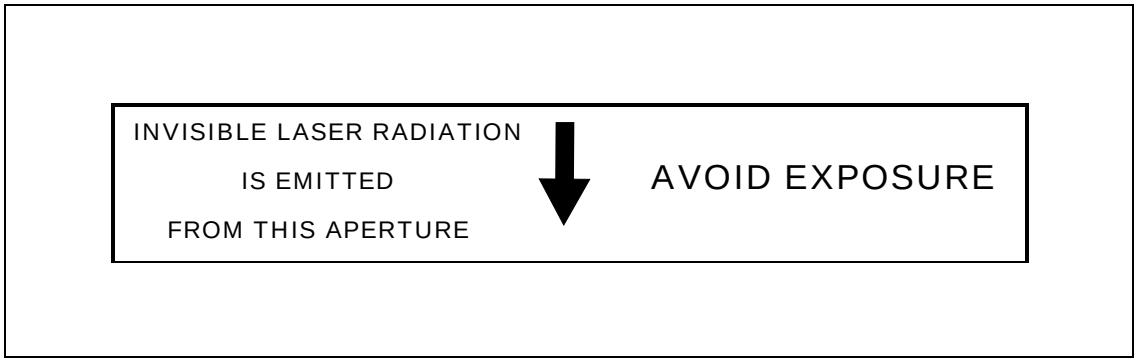


Fig. 2-5 Aperture label

3. Labels for non-interlocked protective housing
Located at fixed mirror plates and mirror mount blocks

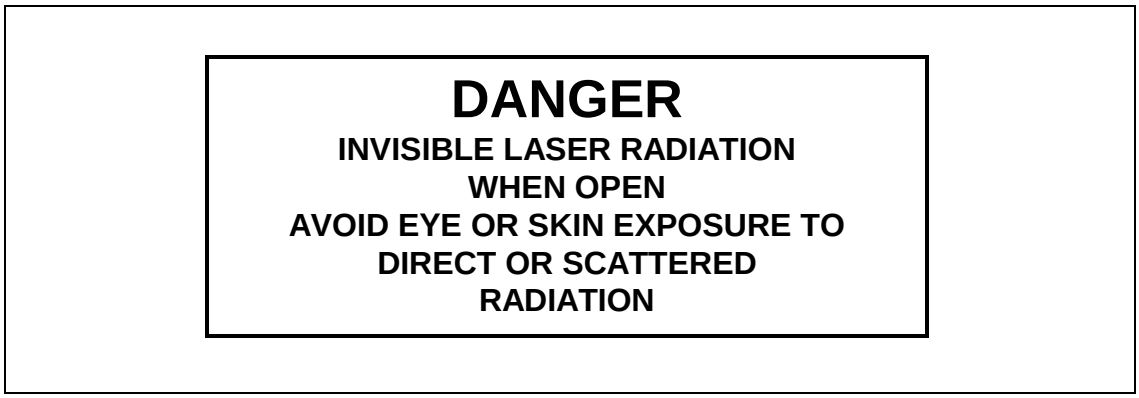


Fig. 2-6 Label for non-interlocked protective housing

4. Label for interlocked protective housing
Located at interlocked panel and manual or automatic opening/closing protective cover (Class 1)

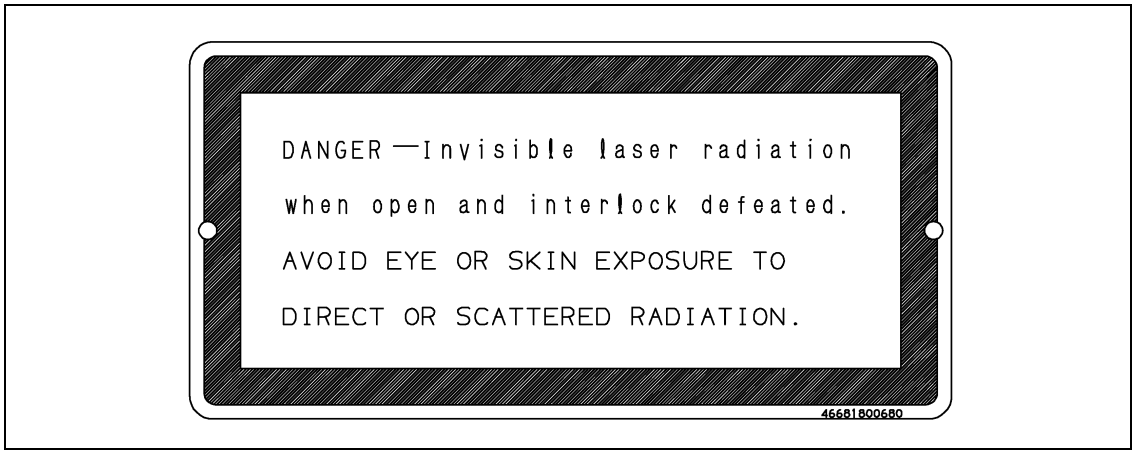


Fig. 2-7 Label for interlocked protective housing

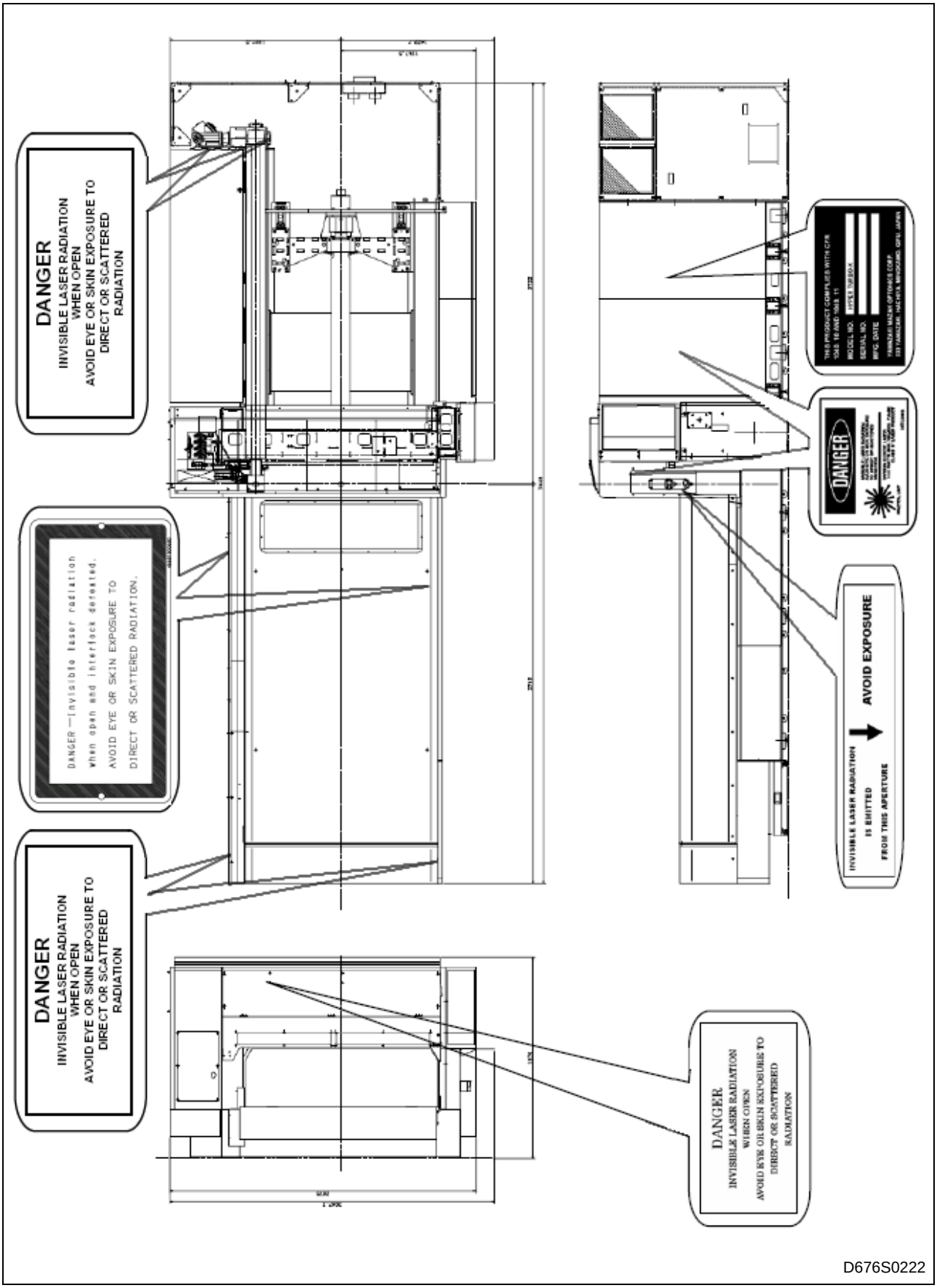


Fig. 2-8 Label locations for Class 1

5. Warning labels

Where there is a danger of high voltage or of being struck by the laser beam in the resonator, there are labels affixed to positions as indicated in the following illustration.

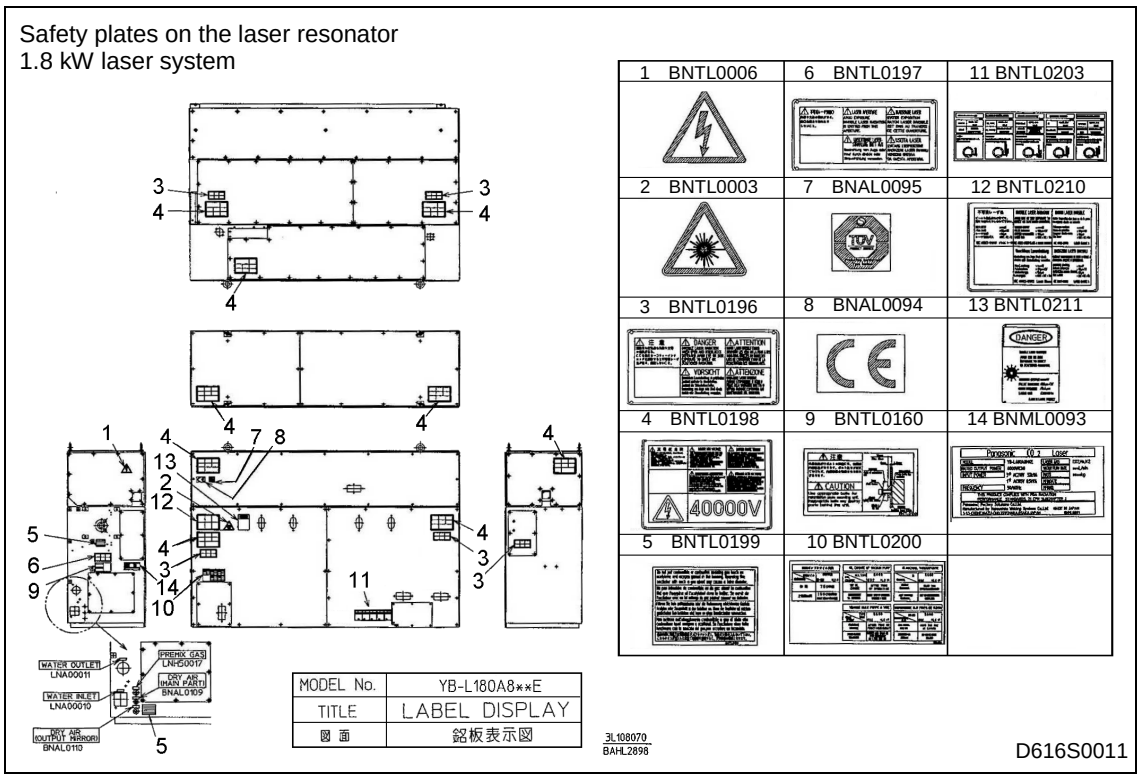


Fig. 2-9 Safety plates on the laser resonator (1.8 kW laser system)

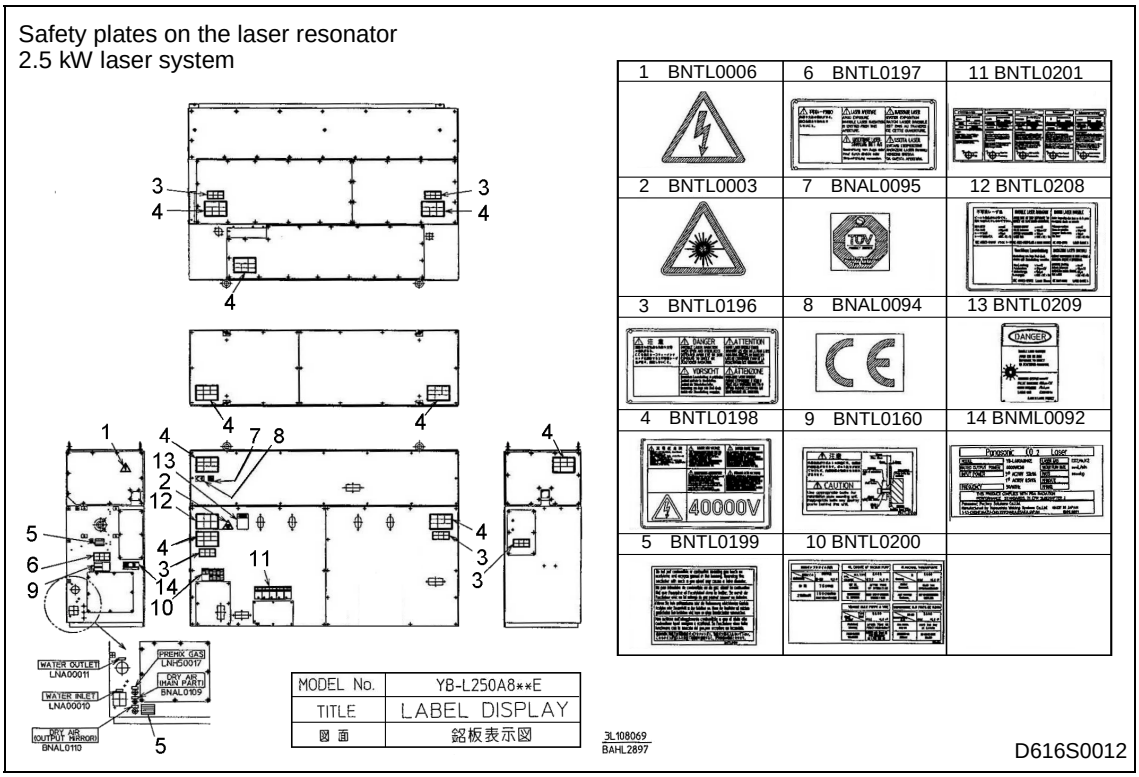
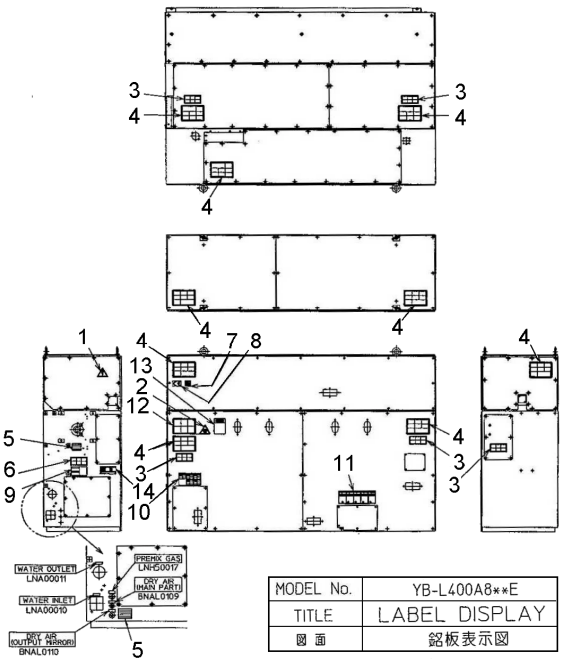


Fig. 2-10 Safety plates on the laser resonator (2.5 kW laser system)

Safety plates on the laser resonator
4 kW laser system



MODEL No.	YB-L400A8**E
TITLE	LABEL DISPLAY
図 面	銘板表示図

3L108068
BAHL2896

1 BNTL0006	6 BNTL0197	11 BNTL0201
2 BNTL0003	7 BNAL0095	12 BNTL0194
3 BNTL0196	8 BNAL0094	13 BNTL0195
4 BNTL0198	9 BNTL0160	14 BNML0091
5 BNTL0199	10 BNTL0200	

D616S0013

Fig. 2-11 Safety plates on the laser resonator (4 kW laser system)

2-2 Safety Precautions (Laser)

This section explains the necessary notes on safe operations of the laser machine. Read through and fully understand the contents before operations. To ensure safer laser machine operations read through the SAFETY PRECAUTIONS prescribed in the PROGRAMMING MANUAL as well.

2-2-1 Rule

1. This machine is provided with various safety devices to protect the operator and the machines.
   However, these cannot cover all aspects of safety, therefore the operator must thoroughly read and understand this chapter before operating the machine. The operator should also take into consideration other aspects of safety related to particular environmental conditions and materials.
2. The meanings of our safety precautions to DANGER, WARNING and CAUTION are as follows:

DANGER : Failure to observe these instructions could result in loss of life.

WARNING : Failure to observe these instructions could result in serious harm to a human life or body

CAUTION : Failure to observe these instructions could result in minor injuries or serious machine damages.

2-2-2 Safety of the laser machine

Here is explained the safe operation of the machine. The MAZAK laser machine is a safe industrial laser machine tool. There are, however, some basic precautions that you must follow to ensure the safety of your operator.

1. Hazards of laser cutting machines

There are four basic hazards associated with CO_2 Laser cutting machines as follows.

A. Contact of laser beam

The contact of the CO_2 beam to eye or skin.

B. Fire

Fire danger by either spatter from the worksheet or from direct contact of the CO_2 Laser beam with flammable materials, or due to use of assist gas.

C. Toxic fumes

Toxic fumes emitted from exotic materials.

D. Lethal high voltage shock

Lethal high voltage shocks from electrical cabinets caused by untrained personnel.

2-2-3 Contact of the laser beam

1. Possible hazards

- The laser machine emits a very high powered carbon dioxide laser beam that is not visible to the human eye. It is very important to handle this machine with an extreme care due to the following possible skin and eye hazards.
  Contact with the laser beam can cause serious burns.

WARNING

- NEVER place any part of your body or clothing underneath or in front of the direct path of the laser beam. Contact of your skin or clothing with the laser may result in immediate ignition of either skin or clothing or both.

- The CO_2 laser beam can reflect off the workpiece surface and indirectly contact eyes or skin. This can also produce serious burns to eyes or skin.

2. Recommended safety precautions

- When using the laser machine always wear protective eye ware. Safety glasses made of either plexiglass or plastic with side guards are recommended. Prescription glasses are permissible but also should have side guards to deflect any stray CO_2 radiation from the machine.
  Gloves and long sleeve shirts are also recommended to ensure safety when operating the system. Parts that come from the laser machine (especially steel parts) are sometimes very hot after they have been laser processed. Wearing gloves helps to prevent any minor burns that can occur after processing. Long sleeve shirts are recommended as a preventive factor to protect the operators arm from any stray CO_2 radiation.
  NEVER STARE DIRECTLY AT THE LASER BEAM WHILE IT IS CUTTING.
  Even with eye protection it is not recommended that the operator stare directly at the laser torch while the shutter is open.

WARNING

- NEVER make contact with the CO_2 laser beam!

2-2-4 Danger of fire from spatter or laser beam

1. Possible fire hazards

When laser processing with the laser machine there is a possibility of scattering hot fragments to flammable materials near the workpiece area. It is strongly recommended that you are aware of the following hazards.
Hot fragments of the material can scatter and hit objects in the surrounding area.
The CO_2 beam or a reflection of it could come into contact with flammable materials.

2. Safety measures

Keep flammable materials at least 10 ft away from the work area. Flammable materials are considered to be any solid material (paper, wood, cardboard or plastic) or volatile liquid (such as gasoline, acetone, kerosene, aerosol cans etc.) that can ignite on contact.
When laser processing materials such as plastics and wood, use an inert gas such as nitrogen or helium to prevent uncontrollable ignition of the material.

WARNING

- NEVER use oxygen as an assist gas when processing wood, plastic, cardboard, paper or cloth products.
- Fire could arise when wooden, plastic or other flammable materials are machined. In this case it is the responsibility of management to ensure a fire extinguisher is readily available as a safety measure. Additionally, the machine should never perform unmanned operation. An operator must always be present to ensure safety.

A shield between the work area and the operator should be either built or provided by the manufacturer (MAZAK) to inhibit the possible deflection of either CO_2 radiation and/or hot fragments. If the shield is built by the owner of the machine it should be made of sheet metal.

2-2-5 Danger of a fire from assist gas

1. Possible hazards

There are times when oxygen gas is used at the assist gas for laser processing. When oxygen gas is used, provide a special gas circuit. If the oxygen gas is connected to any but a special oxygen gas circuit and laser processing is conducted a fire could occur. There should be no oil inside the piping used to connect the oxygen gas cylinder.

2. Safety measures

When oxygen gas is used as the assist gas during laser processing then connect the oxygen to a special oxygen supply port.

WARNING

- Do not use oxygen gas in a high-pressure assist gas circuit.

2-2-6 Potential fire and explosion hazards of the dust collector

1. Potential hazards

- The laser machine gives off spatter, soot, coal dust, and/or other dust particles. Emission of these substances can result in dust explosions.
- The chips occurring during no-oxidation cutting (such as aluminum machining with a nitrogen gas) may get burned or ignited by chemical reactions with the moisture that is contained in air.

2. Safety measures

Institute the following measures so as to avoid the hazards mentioned above:

WARNING

- Keep combustibles away from the dust collector.
- During and after no-oxidation cutting, clear dust particles away from the dust collector and the hose connection box as far as possible.
- Check the interior of the dust collector's dust box and remove dust from the dust box at least once every 100 hours of operation. Similarly, check and clean the hose connection box and the dust suction port each day, and the duct at least once a month.
- If the user is to install a special dust collector, design and fabricate it so that spatter or fire does not break out. Also, install a pre-duster and provide metallic piping.

2-2-7 Cleaning the head and periphery

Clean all sections dirty with dust particles and/or oils each day so as to prevent fire from occurring. Use a cloth to clean.

2-2-8 Oxygen leakage check

If oxygen leakage is discovered, immediately stop the machine. Continued operation of the machine with oxygen leaking can result in fire.

2-2-9 Danger of fire due to fast piercing

1. Possible hazards

Machining that uses fast piercing causes very hot spattering in great quantities. Spattering can result in fire.

2. Safety measures

For piercing, use either quick piercing method or step piercing method, but do not use fast piercing method.

2-2-10 Toxic fumes

1. Possible hazards

When cutting some materials, there is a potential danger from the fumes emitted as the material is laser processed. It is necessary to evaluate the material before processing and to be very careful in the selection of materials that are to be cut with the laser. Some materials (such as lead, PVC, fiberglass, galvanized steed and some calcium based composites) are very dangerous to cut because of the toxicity of the fumes they emit.

2. Safety measures

WARNING

- Before machining, check with the guidebook of dangerous materials for welding that a worksheet material does not generate toxic gases.

For details of danger from toxic fumes, refer to the guidebook of dangerous materials for welding, etc.

2-2-11 Lethal high voltage shock

1. Possible hazards

The laser oscillator of the laser machine operates at 40000 V.

DANGER

- The only person allowed to touch the laser oscillator should be a certified electrical engineer or Mazak service engineer. AT NO TIME SHOULD AN EMPLOYEE OF THE COMPANY THIS MACHINE IS SOLD TO BE RESPONSIBLE FOR ANY ENTRY INTO THE POWER SUPPLY OF THE LASER. Mazak waives any legal responsibility of injury or death due to unauthorized entry into the power supply unit, beam enclosure or oscillator cabinet.

2. Safety measures

The user is prohibited from doing any repairs or adjustments to the electrical parts of the laser oscillator. Please contact a Mazak service engineer for adjustment and repair.

2-2-12 Laser and shutter keys

There are two keys on the machine that demand attention in regards to safety: the laser control key and the shutter switch key. These keys should be removed by an authorized person when the machine is not in operation. These keys should be put in a safety place and should not be accessible to any personnel other than the person responsible for them.

Note: The shutter switch key is not necessary for operation of the laser machine system. Its main purpose is for maintenance. The user should properly control this key so that it is not handled by persons not officially trained by Mazak.

WARNING

- If a person not trained handles the shutter switch key, he or she may or will suffer injury such as burns.

2-2-13 Machining a material covered with a protect sheet

WARNING

- If the material to be machined has an attached protect sheet of vinyl chloride, detach the protect sheet before machining the material. If the vinyl chloride itself is machined, this will not only cause machining defects, but also send off a chlorine gas, thus resulting in machine corrosion and/or personal injury.
  Confirm the kind of material used as the protect sheet.
  For aluminum materials protected with a plastic sheet, machining with the plastic protect sheet remaining attached will help reduce dross. Before starting the machining operations, however, make sure that the material of the protect sheet is not vinyl chloride.

2-2-14 Handling precautions on parts made of a zinc selenide (ZnSe) compound

When handling the focusing lens, collimating lens, oscillator internal output mirror, final-stage mirror, and other parts made of a zinc selenide (ZnSe) compound, strictly observe the following precautions and pay careful attention to preventing the occurrence of fatal accidents:

DANGER

- Under normal environmental conditions, zinc selenide (ZnSe) compounds are chemically stable substances and the toxicity of these substances themselves is not confirmed. When these zinc selenide (ZnSe) compounds are decomposed, however, the resulting zinc and selenium are likely to change into toxic compound substances as a result of combustion and/or of reaction on acid substances. The inhalation of the gases thus produced will cause fatal accidents.

1. Do not dispose of the lenses, the output mirror, or the final-stage mirror together with general garbage, even after these parts become unnecessary. Burning these parts in an incinerator, in particular, is strictly prohibited. The gases arising from the combustion of these gases are extremely poisonous and if inhaled, can result in fatal accidents.
2. Ask a licensed industrial waste treatment company to dispose of the lenses, the output mirror, and the final-stage mirror.
3. The lenses must be stringently kept and controlled by the proper handling responsible person so that unauthorized persons cannot easily touch.
4. When the lenses require maintenance operations such as replacement and cleaning, perform the operations under an environment not having fire, acids, or bases (alkalis) nearby. If a chemical reaction occurs, a dangerous situation will result since poisonous substances will be created.
5. When handling the lenses, put on thumbstalls and do not touch with bare hands. If the fat of fingers sticks, lens damage (burning) by laser light will result.
6. In case of lens, output mirror, or final-stage mirror damage (burning), ventilate the working room and after leaving it at once, wait for all gases and dust particles to settle down.
7. Gather and collect damaged lens and/or mirrors, and then store the pieces into a plastic bag taking care not to stir up dust. If the damaged optics have changed into dust particles, sweep them all using a vacuum cleaner equipped with a high-performance filter. Be sure to wear body protection when working. Damaged optics must not be washed in water or drained into sewers.
   After the collection, wash hands, nails, eyes, and the face completely and carefully with soap and running tap water.
8. Do not inhale dust laden with any pieces of damaged optics. If any such dust has been inhaled, an immediate medical checkup is required.
9. In case of contact with the eye, immediately wash in a plenty of running water and undergo a medical checkup.
10. In case of inadvertent swallowing, fully clean the inside of the mouth, then forcibly vomit by drinking a plenty of water and inserting fingers into the throat, and immediately undergo a medical checkup.

2-2-15 Other gravities

1. Danger to exposing your eyes and skin to the spatters from a worksheet being machined.

- DO NOT expose yourself to the spatters from a worksheet being machined especially when it is machined in a test cut or under unstable machining conditions. Otherwise, you may get burnt or be hazardous to abrapsy.

2. Wear clothes and goggles to protect yourself from CO_2 laser in laser machine operation.
   Our laser machine is equipped with manual opening/closing protective cover (Class 1) or can be equipped with optional automatic opening/closing protective cover (Class 1) for the operator's safety.

   Obtaining special eye protection
   Special eye protection against the CO_2 laser is available as an optional item. Order it from our Sales or Quality Assurance Section.

3. Compressor fire hazards

- Do not place oxygen containers or oxygen release valves near the air intake port of the compressor. Failure to observe this precaution leads to fire.

2-2-16 Service

If you have a problem with your laser machine system, please contact your local Mazak service representative. DO NOT ATTEMPT TO SERVICE THE MACHINE YOURSELF.

2-2-17 Door interlock for manual or automatic opening/closing protective cover (Class 1)

1. All Class 1 laser systems will be equipped with totally enclosed covers with this door interlock for safe operation.
2. When the door is opened the following will occur.
   - Auto operation
     1) Feed hold (machine will stop)
     2) Beam shutter will close
     3) High voltage OFF
     4) Alarm display
   - Manual operation
     1) Beam shutter close
     2) High voltage OFF
     3) Alarm display

2-3 Safety Precautions (Machine)

2-3-1 Rule

1. This machine is provided with various safety devices to protect the operator and the machines. However, these cannot cover all aspects of safety, therefore the operator must thoroughly read and understand this chapter before operating the machine. The operator should also take into consideration other aspects of safety related to particular environmental conditions and materials.
2. The meanings of our safety precautions to DANGER, WARNING and CAUTION are as follows:

DANGER : Failure to observe these instructions could result in loss of life.

WARNING : Failure to observe these instructions could result in serious harm to a human life or body.

CAUTION : Failure to observe these instructions could result in minor injuries or serious machine damages.

3. Always observe the safety instructions inscribed on the safety plates fixed to the machine. Do not remove or damage these plates. If a plate is damaged or becomes illegible, contact Mazak Technical Center or Technology Center.
4. Do not attempt to operate the machine until you have read all of the manuals (OPERATING, MAINTENANCE, PROGRAMMING MANUALS etc.) supplied with the machine and have understood each of the functions and operating methods.

2-3-2 Basic safety precautions

DANGER

- The laser oscillator uses high 40000 volts. Users are not allowed to adjust or repair it. Negligence may be endangered to death or electric shock.
- There are high voltage terminals on the electrical control panel, transformer, motors, junction boxes and other equipment (with a battery warning mark ⚠ attached).
  Do not touch any of them under any circumstance.

WARNING

- Never touch or try to touch a moving part like the torch, the table, etc. of the machinery during operation. Or never place a part or whole of your body in the place catching it.
- Never be near an area to be suspected dangerous like the vicinity of the torch to protect you from the hazardous laser beam or spatters.
- Fully understand the operation of the emergency stop pushbutton so that you can operate it at any time.
- Don't turn on the power under the condition of the door or the protective cover removed.
- Don't open the door, the cover, etc. of the laser machine during automatic operation.
- Don't operate the switches or the like with wet hands.

CAUTION

- Take full care not to have your hands or fingers caught by the worksheet clamp, or the worksheet support.
- Shut down the main power breaker when the power failed.

2-3-3 Clothing and personal safety

WARNING

- Tie up your long hair back and loose sleeves and avoid wearing a necktie, necklace, etc. to prevent them from being caught by a machine drive.
- Always wear safety protectors like safety shoes.

CAUTION

- Always wear a dust mask if a material which produces dust is machined.
- Always wear gloves to handle a hot or sharp edge worksheet.
- Always operate the machine in good health conditions. Should any abnormality be felt, avoid operating the machine.

2-3-4 Precautions related to operation

1. Fully understand the contents of the OPERATING MANUAL before starting operation of the machine.

WARNING

- Check that all safety covers, etc. are in position and perfect. If imperfect, change or repair it.
- Make sure that a worksheet has securely been clamped by the worksheet clampers before operation so that it does not move while in operation.
- Don't operate the switches on the operation panel with gloves on. Failures will cause machine misoperation or other troubles.
- A power failure or a momentary voltage drop, if occurs when the NC machine is energized, could cause a failure of the hard disk drive. If a thunderstorm is approaching, power off the NC machine immediately, because thunderstorms can cause a power failure and a momentary voltage drop. If the hard disk drive has broken because of such a phenomenon, it will need to be repaired at your cost, even if it is still under warranty.
- A hard disk failure makes it impossible to use the machine. It can also result in the lost of machining programs.

CAUTION

- When you leave the machine after operation, turn off the power switch on the CNC operation panel but don't shut down the main power breaker of the machine.

2. Precautions when starting an automatic operation
   When starting a programmed automatic operation for the first time, a human or mechanical harm or damage is most likely to occur by the spatters flying from improper cutting conditions or by a mechanical interference due to an improper motion path. So carry out an automatic operation, giving the following attentions:

WARNING

- Before starting a cut, wear protective goggles for a CO_2 laser in order to protect yourself from a harm caused by spatters or laser beam reflections.

CAUTION

- Don't start an automatic operation abruptly but check the machining paths correct on the CNC screen beforehand.
- After checking the paths on the screen, move the machine in a single block mode to check the paths proper on the machine. In such an operation, validate the override function in the feedrate and select a safe speed under the power off condition.

2-3-5 Precautions on continuous operation

Continuous operation must always be placed under the supervision of a person. Avoid unattended continuous operation.

WARNING

- Even within their standard service lives (specified separately), the lens, mirror, and nozzle on the laser machine may suddenly be damaged due to an unexpected burst and the spatters thereby, resulting in machining defects. Machining defects, in turn, can result in a burst, and laser beam reflections can cause fire.

CAUTION

- The conditions of the laser beam cutting have to accord with the thickness, internal stress, etc. of the material to be cut. Machining defects may arise from inappropriate cutting conditions and result in a burst, and laser beam reflections can cause fire.

Operation must always be placed under the supervision of a person in order to immediately take measures against burst and fire caused by machining defects and laser beam reflections, respectively, and to perform necessary adjustments.

2-3-6 Precautions related to maintenance

Fully understand the contents of the MAINTENANCE MANUAL before starting maintenance.

DANGER

- Users are not permitted to adjust or repair electrical components of the laser oscillator. Ask Mazak service engineer for such work.

WARNING

- Shut down and lock the main power breaker to prevent someone from misoperating the main power breaker or CNC panel switches by mistake.
- Stand a big signboard near a location of maintenance which requires power on so that any unconcerned person may not touch the machine. Be sure that such a maintenance be carried out by two persons or more as each can give a sign and confirm every operation step each other to go to the next step. In addition, if the maintenance needs no pneumatic pressure, stop it before maintenance.
- Residual voltage stays for a while after the power is shut down. So don't start maintenance until the maintaining circuit is checked by a gauge that no voltage is left.
- Substances that have adverse effects on the environment if not disposed of appropriately are used in some of the equipment used in Mazak laser machine. In order to protect the environment, dispose of laser machine and accessory equipment in accordance with the laws of the country concerned. Entrust the processing to a contractor who deals with industrial waste. Note that any expenses associated with this processing are to be borne by the customer.

2-3-7 Precautions related to workplace

WARNING

- Don't put your hand or finger between a belt and a pulley, a chain and a sprocket, etc.
- Start a machine operation after you have mounted back a cover, etc. in place.
- Provide a countermeasure to protect floor feeding cables, etc. from a short circuit caused by cut chips or the like.

CAUTION

- After a maintenance, keep everything (environmental and maintenance parts) in order and wipe off water and oil so as to get a safe and normal operation back.

2-3-8 Safety devices

The laser machine system has safety devices like doors, covers, interlocks, emergency stop switch, etc. to ensure operator's and machine safety.

WARNING

- The machine is provided with various devices for the operator's safety.
  Never cancel any of the devices.
  Failure to observe this instruction could result in serious harm to a human life or body.

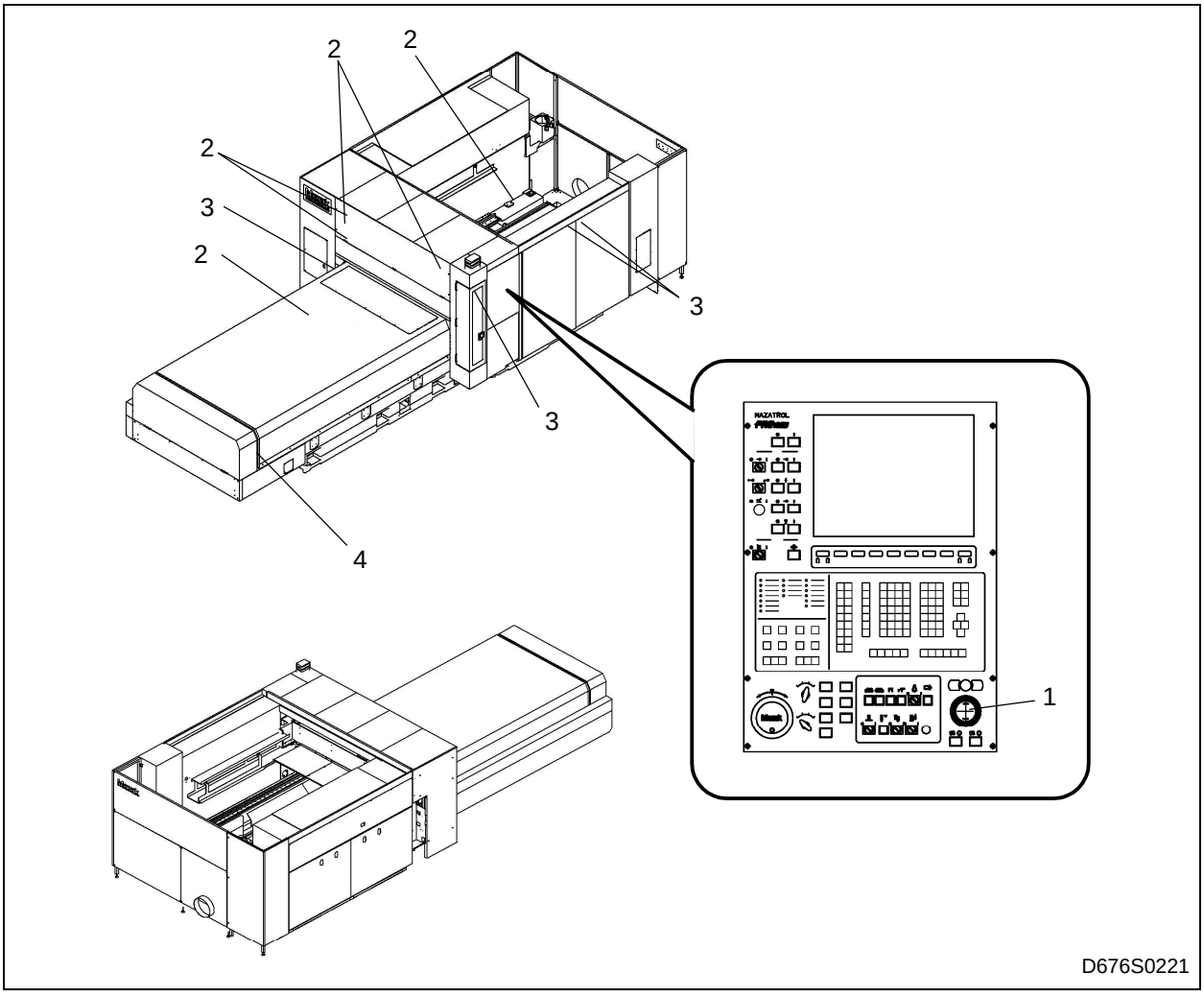


Fig. 2-12 Safety devices of the machine

No.	Part	Description
1	Emergency stop button	Pressing the button on the operation panel stops the machine, closes the beam shutter, and shuts off the laser high-voltage.
2	Over-travel switches (hardware and software)	The switches control the X, Y, and Z axial travels, which are also controlled by software.
3	Safety interlock switches	- Installed in the electric cabinet door When the electric cabinet door is opened, the main power breaker trips to prevent an unexpected electric shock. - Front door, operator's door When the front door or the operator's door is opened in the automatic operation, the machine will be placed in the feed hold state. In the manual operation, the axis feed rate is limited to F2000.
4	Touch switch of the optional automatic opening/closing protective cover (Class 1)	Turing on the touch switch at the end of the automatic opening/closing protective cover (Class 1) stops the cover motion to prevent a human body from being caught.

2-3-9 Safety plates on the machine

To prevent accidents, safety plates are attached on the laser machine body, peripheral equipment, and other places which are suspected to be dangerous or mis-operated because of the characteristics of the laser machine. Always follow the precautions instructed in the safety plates.

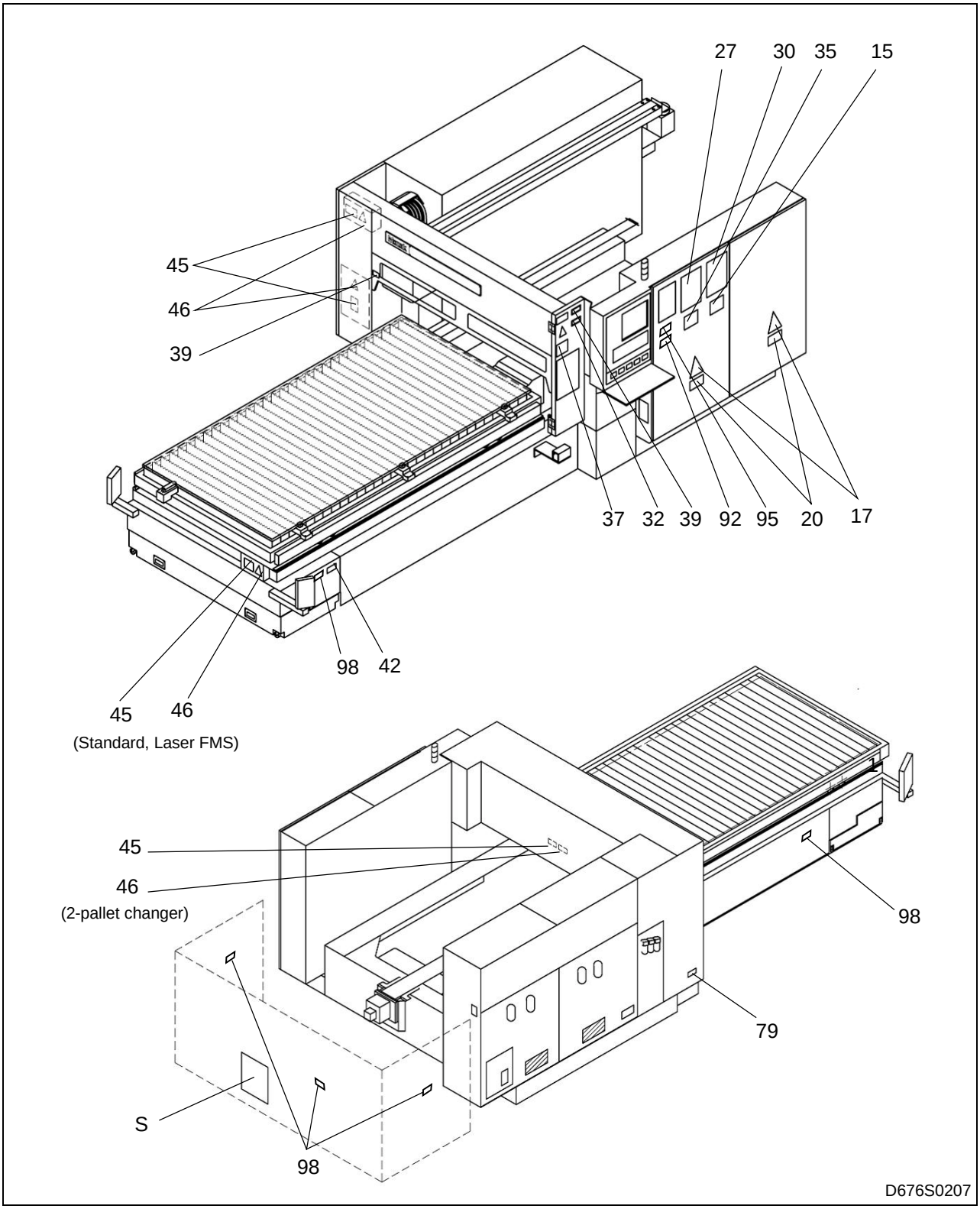


Fig. 2-13 Safety plates on the machine (1/2)

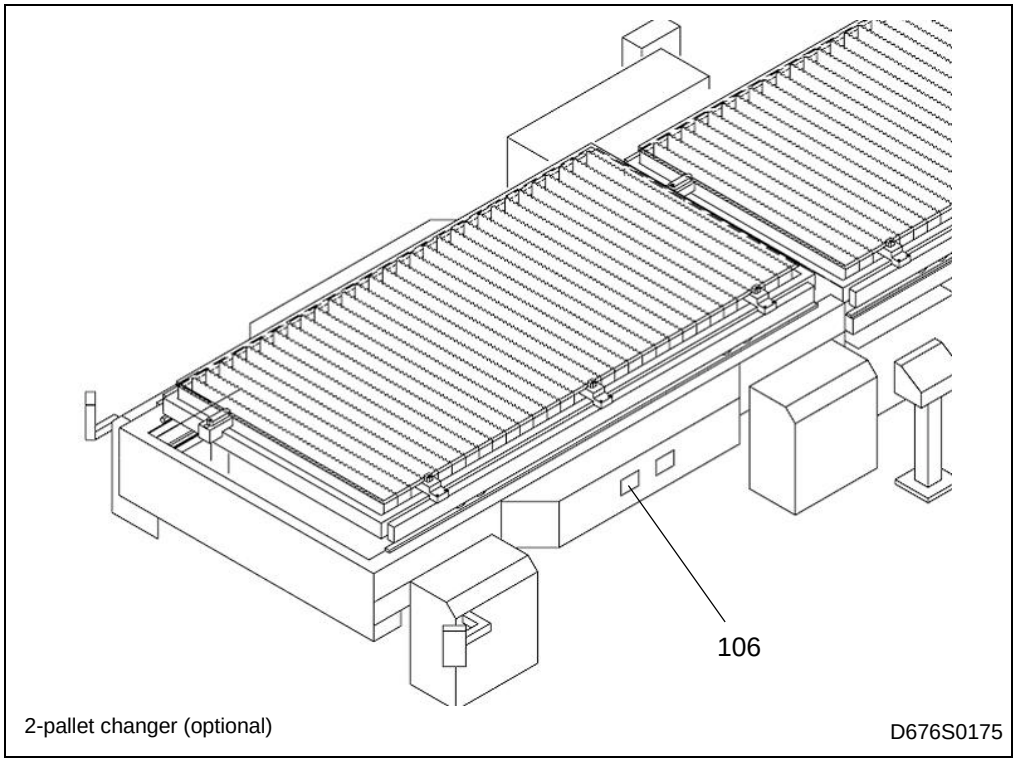


Fig. 2-14 Safety plates on the machine (2/2)

30.

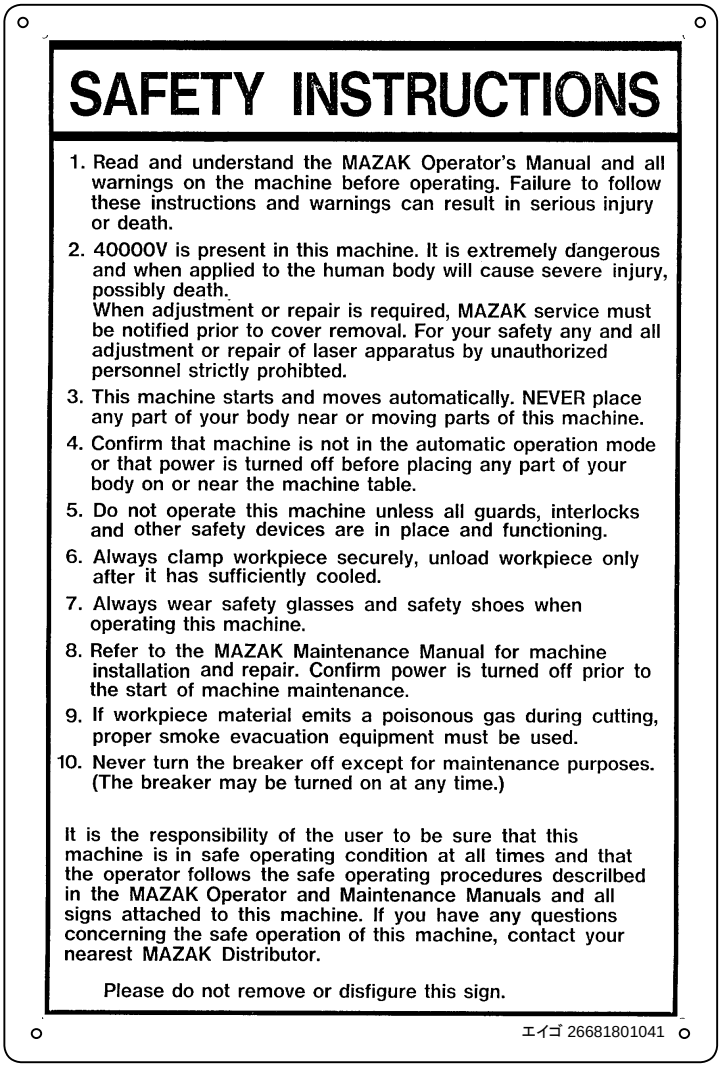

SAFETY INSTRUCTIONS
1. Read and understand the MAZAK Operator's Manual and all warnings on the machine before operating. Failure to follow these instructions and warnings can result in serious injury or death.
2. 40000V is present in this machine. It is extremely dangerous and when applied to the human body will cause severe injury, possibly death.
When adjustment or repair is required, MAZAK service must be notified prior to cover removal. For your safety any and all adjustment or repair of laser apparatus by unauthorized personnel strictly prohibted.
3. This machine starts and moves automatically. NEVER place any part of your body near or moving parts of this machine.
4. Confirm that machine is not in the automatic operation mode or that power is turned off before placing any part of your body on or near the machine table.
5. Do not operate this machine unless all guards, interlocks and other safety devices are in place and functioning.
6. Always clamp workpiece securely, unload workpiece only after it has sufficiently cooled.
7. Always wear safety glasses and safety shoes when operating this machine.
8. Refer to the MAZAK Maintenance Manual for machine installation and repair. Confirm power is turned off prior to the start of machine maintenance.
9. If workpiece material emits a poisonous gas during cutting, proper smoke evacuation equipment must be used.
10. Never turn the breaker off except for maintenance purposes. (The breaker may be turned on at any time.)
It is the responsibility of the user to be sure that this machine is in safe operating condition at all times and that the operator follows the safe operating procedures describbed in the MAZAK Operator and Maintenance Manuals and all signs attached to this machine. If you have any questions concerning the safe operation of this machine, contact your nearest MAZAK Distributor.
Please do not remove or disfigure this sign.
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Fig. 2-15 Safety plate

27.

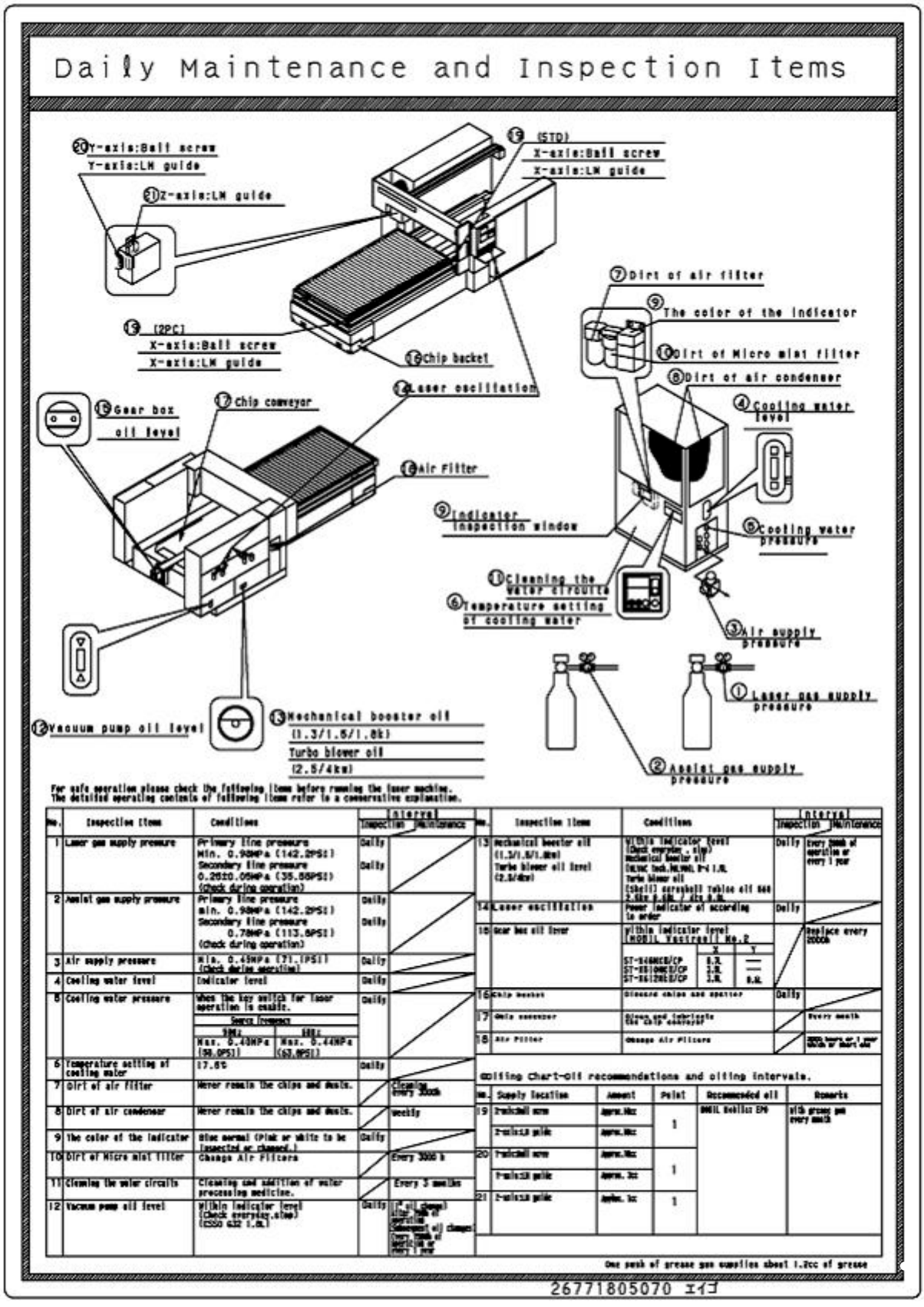
Daily Maintenance and Inspection Items
20 Y-axis:Ball screw
Y-axis:LH guide
21 Z-axis:LH guide
13 (2PC)
X-axis:Ball screw
X-axis:LH guide
18 Chip bucket
15 (STD)
X-axis:Ball screw
X-axis:LH guide
7 Dirt of air filter
9 The color of the indicator
10 Dirt of Micro mist filter
8 Dirt of air condenser
4 Cooling water level
14 Laser oscillation
19 Gear box oil level
17 Chip conveyor
16 Air Filter
5 Cooling water pressure
9 Indicator inspection window
11 Cleaning the water circuits
6 Temperature setting of cooling water
3 Air supply pressure
1 Laser gas supply pressure
2 Assist gas supply pressure
12 Vacuum pump oil level
13 Mechanical booster oil (1.3/1.6/1.8k)
Turbo blower oil (2.5/4kw)
For safe operation please check the following items before running the laser machine.
The detailed operating contents of following items refer to a consecutive explanation.
No. Inspection item Conditions Interval Inspection Maintenance
1 Laser gas supply pressure Primary line pressure Min. 0.98MPa (142.2PSI) Secondary line pressure 0.2±0.05MPa (35.5±7.5PSI) (Check during operation) Daily Daily
2 Assist gas supply pressure Primary line pressure min. 0.98MPa (142.2PSI) Secondary line pressure 0.78MPa (113.8PSI) (Check during operation) Daily Daily
3 Air supply pressure Min. 0.49MPa (71.1PSI) (Check during operation) Daily
4 Cooling water level Indicator level Daily
5 Cooling water pressure When the key switch for laser operation is enable. Daily
Source frequency
50Hz: Max. 0.43MPa (62.4PSI)
60Hz: Max. 0.44MPa (63.8PSI)
6 Temperature setting of cooling water 17.5℃ Daily
7 Dirt of air filter Never remain the chips and dusts. Clean or every 300h
8 Dirt of air condenser Never remain the chips and dusts. Weekly
9 The color of the indicator Blue normal (Pink or white to be inspected or changed.) Daily
10 Dirt of Micro mist filter Change Air Filters Every 3000 h
11 Cleaning the water circuits Cleaning and addition of water processing medicine. Every 3 months
12 Vacuum pump oil level Within indicator level (Check everyday, stop) (ESSO 632 1.8L) Daily (1st oil change After 500h of operation Subsequent oil changes Every 1000h of operation or every 1 year)
No. Inspection item Conditions Interval Inspection Maintenance
13 Mechanical booster oil (1.3/1.6/1.8kw) Turbo blower oil level (2.5/4kw) Within indicator level (Check everyday, stop) Mechanical booster oil (ISO VG# Tank 0.8L/Unit, 2nd 1.0L Turbo blower oil (Shell) corvushell Tobiac oil 868 2.5kw 2.0L / 4kw 3.0L Daily Every 3000h of operation or every 1 year
14 Laser oscillation Power indicator of according to order Daily
15 Gear box oil level Within indicator level (MOBIL Vactra[] No.2 ST-616HCB/CP 0.3L — ST-618HCB/CP 2.0L — ST-618HCB/CP 2.0L 0.3L Replace every 20000h
16 Chip bucket Discard chips and spatter Daily
17 Oil mist separator Clean and lubricate Use Chip cooling oil Every month
18 Air Filter Change Air Filters 3000 hours or 1 year which is short
Oiling Chart-oil recommendations and oiling intervals.
No. Supply location Amount Point Recommended oil Remarks
19 X-axis ball screw Approx.40cc 1 MOBIL Dolitus EP0 With grease gun every month
Y-axis ball screw Approx.40cc
20 Z-axis ball screw Approx.40cc 1
Y-axis ball guide Approx. 2cc
21 Z-axis ball guide Approx. 1cc 1
One push of grease gun supplies about 1.2cc of grease
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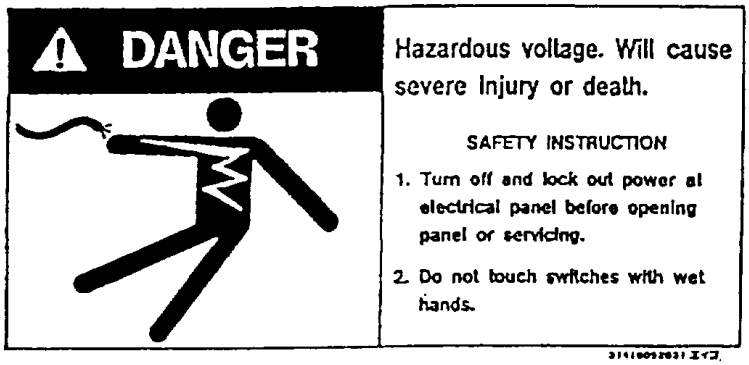
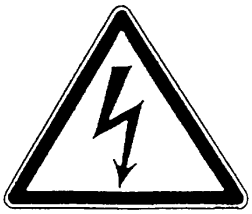
Fig. 2-16 Daily maintenance and inspection items (1.8 kW, 2.5 kW, 4 kW)

20.


DANGER
Hazardous voltage. Will cause severe injury or death.
SAFETY INSTRUCTION
1. Turn off and lock out power at electrical panel before opening panel or servicing.
2. Do not touch switches with wet hands.

17.



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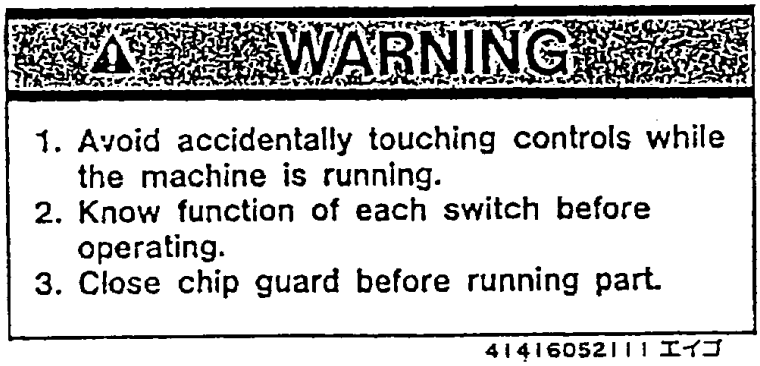
WARNING
1. Avoid accidentally touching controls while the machine is running.
2. Know function of each switch before operating.
3. Close chip guard before running part.
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37.

警 告 · WARNING
異常なスパ・ッタが発生した時は
重大事故を防ぐため直ちに加工を
止めること
そして再度加工条件等を調整して
加工を再開すること
When the abnormal spatter is generated, be sure to stop the processing immed--iately to avoid the grave accident.
And after adjusting the processing conditions again, be sure to resume the processing.
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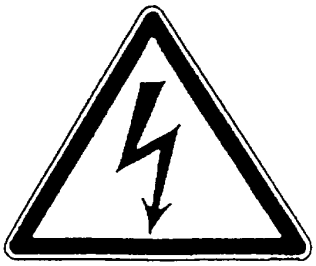
Fig. 2-17 Safety plates (1/4)

46.



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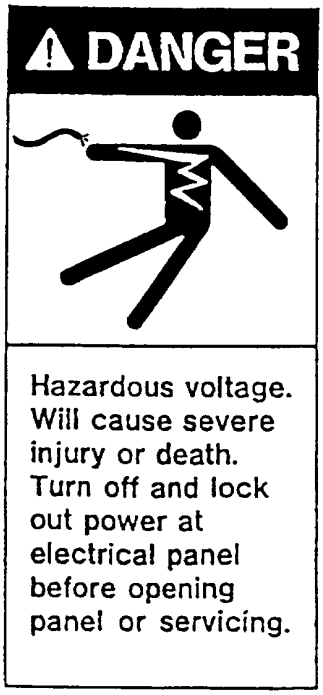

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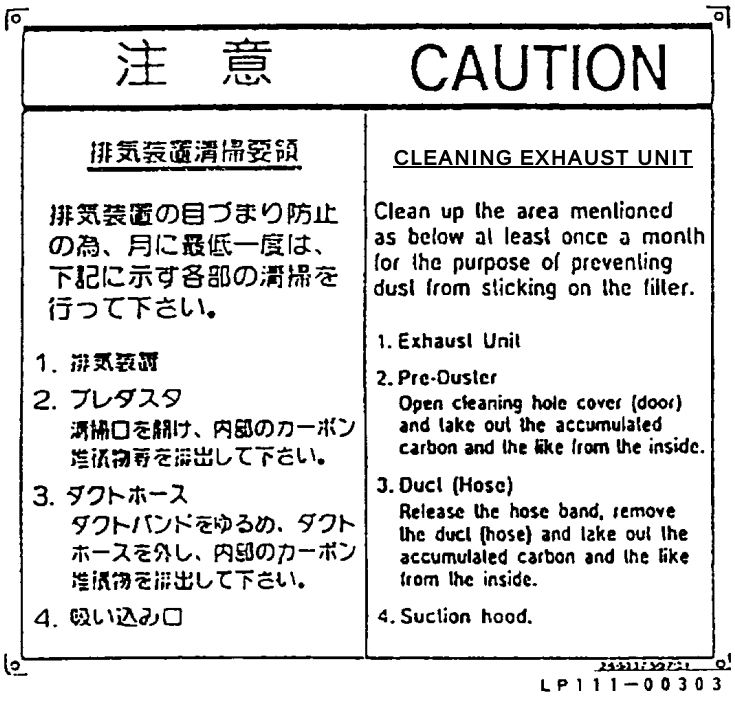

注 意 CAUTION
排気装置清掃要領
排気装置の目づまり防止の為、月に最低一度は、下記に示す各部の清掃を行って下さい。
1. 排気装置
2. プレダスタ
清掃口を開け、内部のカーボン等汚物等を掻出して下さい。
3. ダクトホース
ダクトバンドをゆるめ、ダクトホースを外し、内部のカーボン等汚物を掻出して下さい。
4. 吸い込み口
CLEANING EXHAUST UNIT
Clean up the area mentioned as below at least once a month for the purpose of preventing dust from sticking on the filter.
1. Exhaust Unit
2. Pre-Duster
Open cleaning hole cover (door) and take out the accumulated carbon and the like from the inside.
3. Duct (Hose)
Release the hose band, remove the duct (hose) and take out the accumulated carbon and the like from the inside.
4. Suction hood.
LP111-00303

Fig. 2-18 Safety plates (2/4)

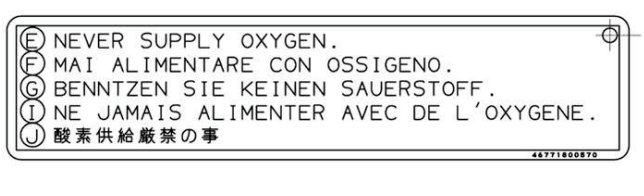
42.

WARNING
Never put your hands on the conveyor during chip conveyor operation.
Failure to comply with this WARNING may cause your fingers or hand to be entangled resullting in serious injury.

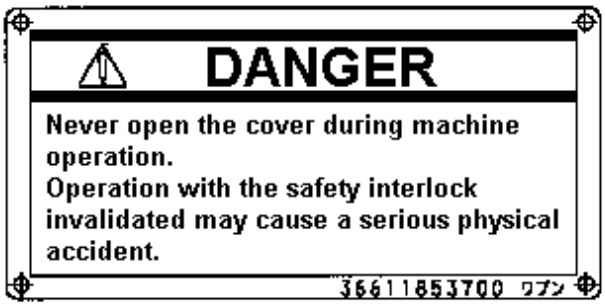
15.

警 告
WARNING
チラー内エア機器のメンテナンス
レーザー加工機へのオイルの進入により火災発生の恐れがあります。1ヶ月毎にチラーの取扱説明書によるエア機器のメンテナンス(フィルター掃除、交換)を行うこと。
尚、チラーへ供給するエアーは十分に油液、水液の取れたものとすること。
MAINTENANCE FOR PNEUMATIC EQUIPMENT INSIDE CHILLER
Oil intrusion into the laser machine may cause a fire.
So maintain the pneumatic equipment (filter change and cleaning) every month according to the chiller operating manual.
Also the compressed air supplied to the chiller must be fully free from oil and liquid.

79.


(E) NEVER SUPPLY OXYGEN.
(F) MAI ALIMENTARE CON OSSIGENO.
(G) BENNTZEN SIE KEINEN SAUERSTOFF.
(I) NE JAMAIS ALIMENTER AVEC DE L'OXYGENE.
(J) 酸素供給厳禁の事

39.


DANGER
Never open the cover during machine operation.
Operation with the safety interlock invalidated may cause a serious physical accident.
36611853700

35.

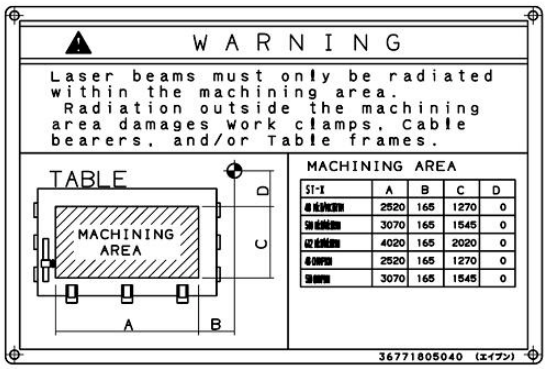
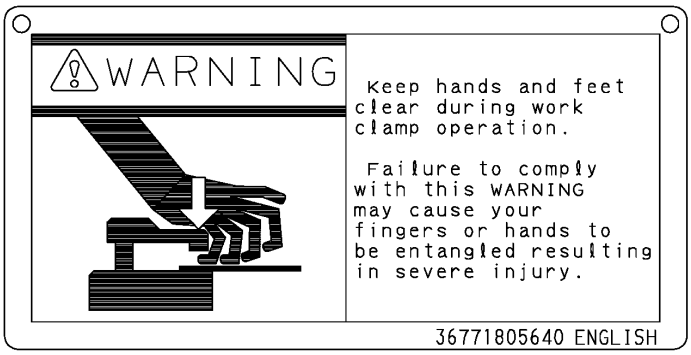
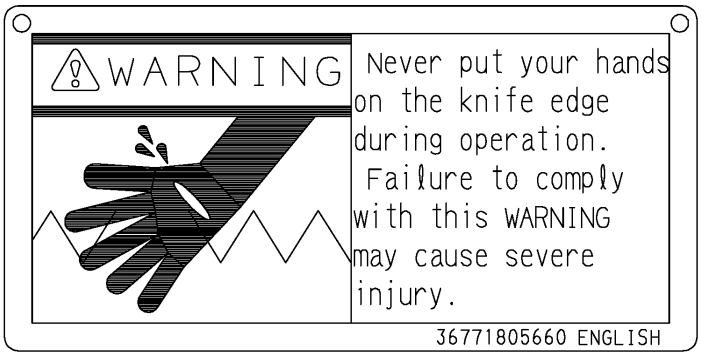


Fig. 2-19 Safety plates (3/4)

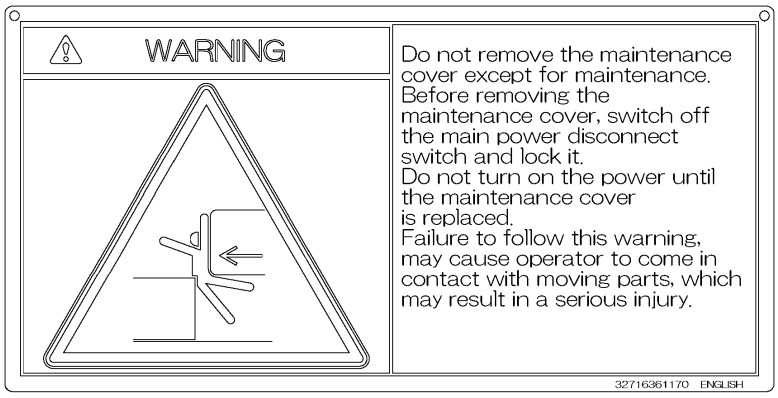
92.


WARNING
Keep hands and feet clear during work clamp operation.
Failure to comply with this WARNING may cause your fingers or hands to be entangled resulting in severe injury.
36771805640 ENGLISH

95.


WARNING
Never put your hands on the knife edge during operation.
Failure to comply with this WARNING may cause severe injury.
36771805660 ENGLISH

98.


WARNING
Do not remove the maintenance cover except for maintenance.
Before removing the maintenance cover, switch off the main power disconnect switch and lock it.
Do not turn on the power until the maintenance cover is replaced.
Failure to follow this warning, may cause operator to come in contact with moving parts, which may result in a serious injury.
32716361170 ENGLISH

106.

WARNING
◉ Keep hands clear of 2 pallet changer which goes up and down.
◉ Keep hands clear of pallet during transfer.
Warning-can cause severe injury.
SAFETY INSTRUCTION
(goes up and down)
1. Confirm if the pallet should be placed firmly.
36771800210

Fig. 2-20 Safety plates (4/4)

2-3-10 Others

When the knife edge supporter is required to change, be sure to mount it so that the knife edge top level does not come above the level of the carbide insert (clamping jaws) of the worksheet clamp. Otherwise the worksheet is shifted and a machining defect will occur.

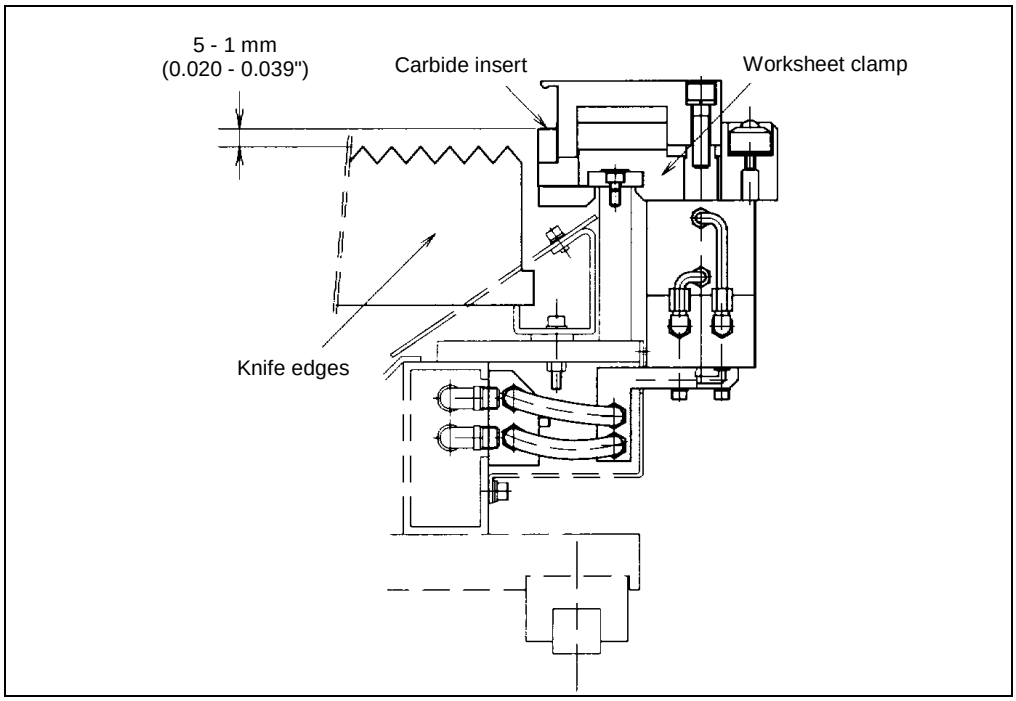


Fig. 2-21 Precautions on replacing the knife edge supporter

2-4 Installation Precautions

To ensure safe operation of the laser machine, note the following during installation.

2-4-1 Wiring

1. Be sure to use electrical conductors with performance ratings equivalent or superior to those described in the maintenance manual.
2. Do not connect to the power distribution panel any power cables for devices which can cause line noise, such as are welders and induction hardening machines.
3. Arrange for a qualified engineer to connect the power lines.

2-4-2 Grounding

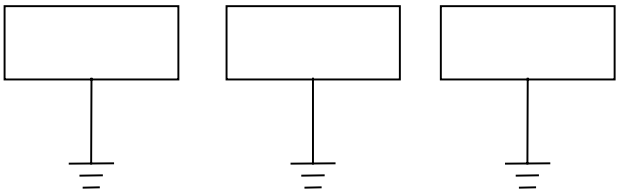
The grounding resistance must be 10 ohms or less, and the grounding cable must be of the same size as that of the power cable (except for a cross-sectional area of at least 38 mm^2; for more than 38 mm^2, at least 50% of the power cable size).
Generally, the laser machine should be grounded to a separate grounding rod. If an independent ground cannot be provided for the machine, prepare the ground connection as follows.

1. Connect a single conductor to its own grounding terminal. This will avoid possible serious accidents resulting from ground currents which might otherwise flow in the laser machine if a peripheral device should malfunction.
2. A separate grounding wire should be used, one whose length is as short as possible.
3. Check the resistance to ground by actual measurement. This should measure less than 10 ohms if a single device is connected to its own grounding rod.

CAUTION

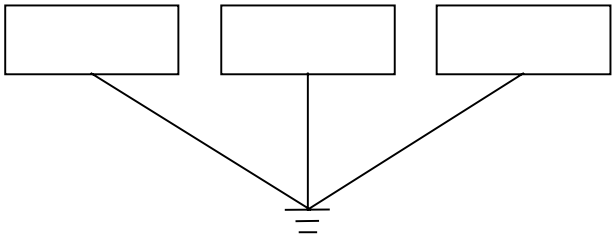
- Do not use a building steel frame as a grounding electrode.

Desirable independent grounding:



Earth resistance: Less than 10 ohms

Common grounds:



Resistance to ground = 10/the number of devices connected (ohms) to the grouding.

Never ground equipment as shown in the following figure:

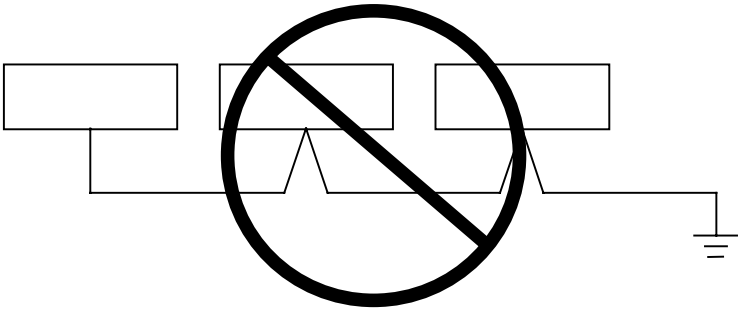


Fig. 2-22

2-4-3 Gas and air pipings

The laser machine uses laser gas for the laser oscillator, assist gas (oxygen, nitrogen, or high-pressure air, etc.) for machining, and air for the laser machine drive and dust prevention. Qualities of these gases and air piping for them largely effect machining performance and machine life.

1. Laser gas

1. Use only mixed gas specified.
2. The laser gas especially hates water, so purchase the specified gas from well-controlled supplier of bombs.
3. Use a bomb regulator with a 2-step pressure and less variable supply pressure which qualify the following specifications:

   Primary pressure: 14.72 MPa
   Secondary pressure: 0 - 0.29 MPa
   Flow amount: More than 50 L/min (1.77 ft^3/min) [0.25 MPa]
4. To prevent contamination from the piping materials use teflon tubes for the gas piping from the laser gas cylinder to the oscillator.
5. Gas piping between the laser oscillator and the gas bomb must be free from gas leakage, otherwise the gas mixture rate in the laser oscillator changes and consequently it drops the laser output or damages equipment.

2. Assist gas

A. Oxygen or nitrogen

1. Use oxygen or nitrogen containing less than 5 ppm water and of more than 99.9% purity. Otherwise machining fails.
2. Use a bomb regulator which qualifies the following specifications:

   Primary pressure: 14.71 MPa
   Secondary pressure: 0 - 1.96 MPa
   Flow amount: More than 320 L/min (11.30 ft^3/min) [0.78 MPa]

   Insufficient flow amount causes machining failure due to pressure loss.
3. When you use a liquefied gas, be sure to use an evaporator whose capability is more than double of the flow amount. Otherwise it invites pressure drop as well as equipment failures due to invasion of cold gas into the gas control circuit.
4. To prevent gas leakage or impurity invasion from gas piping use metallic pipes.
5. Flush rust and foreign materials off the pipe interior. Otherwise the gas control system fails.
6. Oxygen gas is flammable, so the pipe interior must be free from petroleum, oil, grease, and other flammable materials.

B. High-pressure air

1. Dirty air invites lens damage and machining failure. Use a filter and a drier to remove oil and water out of air.
2. Check the drain, oil, and filter of the compressor as specified so that dirty air does not come out.
3. Provide a receiver tank in the high-pressure air circuit to prevent pulsation from occurring.

3. Air for the laser machine drive and dust prevention

1. Air for laser machining is used for protecting the laser oscillator and the optical system from dust. Dirty air or wet air damages the oscillator and optical equipment.
2. Air containing dirty air or moisture will damage the laser oscillator or optical components.
3. Never let the laser machining air be mixed with organic compounds or solvents. Otherwise the beam diffuses to cause cutting failures.
4. Provide a drain hole at a concave portion and at a pipe rising portion to drain water from the pipe between the compressor and the chiller import.
5. If air contains water, provide a drain at the chiller import to take water out. Otherwise the filter type drier will be damaged.
6. Air must be supplied at a pressure from 0.5 to 0.8 MPa and a flow rate of 200 L/min (7.06 ft^3/min) (ANR).

4. Cooling water specifications

A. Water quality

Use the water which conforms to the following water quality standard:

Item			Unit	Standard value
Standard items	pH (25°C or 77°F)			6.0 to 8.0
	Conductivity (25°C or 77°F)		μs/cm	300 or less
	Chloride ion	Cl^-	mg/L	50 or less
	Sulphate ion	SO_4^{2-}	mg/L	50 or less
	Acid consumption (alkalinity) (pH 4.8)	$CaCO_3$	mg/L	50 or less
	Total hardness	$CaCO_3$	mg/L	70 or less
	Calcium hardness	$CaCO_3$	mg/L	50 or less
	Ionic state silica	SiO_2	mg/L	30 or less
Reference items	Iron	Fe	mg/L	0.3 or less
	Copper	Cu	mg/L	0.1 or less
	Ammonium ion	NH_4^+	mg/L	1.0 or less
	Sulfide ion	S^{2-}	mg/L	It must not be detected.
	Residual chloride	Cl	mg/L	0.3 or less
	Free carbon	CO_2	mg/L	4.0 or less

Note 1: Normal service water is satisfied with the above standard. However, some districts may bear greater values. In such a case, we recommend you use distilled water.

Note 2: Never use industrial water or underground water for this purpose.

B. Additives

It is recommended that the following cooling water additives be used to adjust the water quality in areas with particularly poor water quality, to wash out the cooling water system, and to prevent freezing in areas with particularly cold weather. Before using any additive, first consult with the manufacturer of the chiller. In addition, be sure to refer to the additive instructions for information regarding usage precautions and handling methods.

- Water quality adjustment agent	CONTLIME K-6000	(DIA AQUA SOLUTIONS)
- Washing agent	DESLIME	(DIA AQUA SOLUTIONS)
- Anti-freeze	Aurora Brine	(Tokyo Fine Chemical)

Note: For the piping in the water recirculation circuit use materials that will not rust or corrode (stainless steel, brass).

5. Air for an optional FMS

1. The FMS air is used to suck a worksheet and to move the loader/unloader vertically. Dirty or wet air will clog filters to shorten filter lives.

6. Air for a dust collector

1. Dirty air and wet air cause filter clogs and shorten filter life. So air is needed to blow dust off the filters of the dust collector.

7. Others

With the compressor

1. It is necessary to confirm the amount of air discharge for selecting a compressor.
2. Use a compressor whose catalogued air discharge capacity is at least 1.2 times the amount of air required for the laser machine.
   When converted for removal of moisture and accommodation of temperature changes, the air discharge capacity of the compressor decreases in the amount of air which can be actually used.
3. If a reciprocating compressor is continuously driven at its power limit, air contains oil and carbides which deteriorate machining accuracy or burns the compressor.
4. Select a reciprocating compressor which can provide 1.4 times or more of necessary power.
5. Do not install a compressor at a paint shop or a place near organic compounds or a dust generating area.

2-4-4 Environmental conditions

Generally, the machine will have the following specifications. However, these may change over a period of time or in response to seasonal changes.

Supply voltage:	+10 to –10% rated supply voltage
Source frequency:	Rated frequency ±1 Hz
Ambient temperature:	0 to 35°C (32 to 95°F)
Humidity:	Max. 85% (Temperature changes should not cause condensation.)
Atmosphere:	Free from excessive dust, acid fumes, corrosive gases and salt.
Exposure to direct sunlight or heart rays which can change the environmental temperature should be avoided.	
Avoid exposing the NC machine to abnormal vibration.	
Maximum acceleration:	0.686 m/s^2 (0.23 ft/s^2)
Maximum amplitude:	7 μm

If it is difficult to meet these conditions, contact Mazak Technical Center or Technology Center immediately.

3 SAFETY IN MAINTENANCE

3-1 Safety Equipment Inspection

If any trouble occurs in the laser machine, contact Mazak Technical Center or Technology Center.

1. Operation switches

No.	Inspection items	Contents	Remarks
1	EMERGENCY STOP button	When the EMERGENCY STOP button is pressed: - The high voltage supply is turned off.	Daily
2	FEED HOLD button	When the FEED HOLD button is pressed during automatic operation: - The laser shutter is closed, - The laser discharge is stopped, and - The assist gas supply is stopped.	Daily

2. Alarm system

No.	Inspection items	Contents	Remarks
1	HIGH VOLTAGE indicator	When the HIGH VOLTAGE **I** (ON) button is pressed, the yellow signal light goes on and then the HIGH VOLTAGE indicator on the operating panel is turned on in 10 seconds.	Daily

3. Interlock system

No.	Inspection items	Contents	Remarks
1	Interlock for the manual opening/closing protective cover (Class 1) and the automatic opening/closing protective cover (Class 1) (option)	Alarm No. 268 is displayed with the FEED HOLD indicator lamp turned on by pressing the CYCLE START button if the manual or automatic opening/closing protective cover (Class 1) is open (not completely closed) with the M/C SET UP switch set to **O**.	Daily
2	**[M CODE LOCK]** menu function	The M-codes are properly skipped in the flow of the program when the **[M CODE LOCK]** menu function is valid.	Daily
3	SHUTTER OPEN indicator	The red signal light goes on when the laser shutter is opened.	Daily
4	Operator door interlock	Opening the operator door causes the following for each mode of operation: - For automatic operation: Feed hold state, - For manual operation: Axis motion speed is limited to F2000.	Daily

- NOTE -

4 DAILY INSPECTION OF LASER MACHINE

Inspect the following items daily before operating the laser machine.

4-1 Maintenance and Inspection

Table 4-1 Daily inspection items

No.	Inspection items	Contents	Remark	Reference section
1	Laser gas supply pressure Primary pressure of the regulator Secondary pressure of the regulator	 0.98 MPa or more 0.25 ± 0.05 MPa during machine operation	Gas mixture ratio: He 74.9 % N_2 23.4 % CO_2 1.7 %	—
2	Assist gas supply pressure Primary pressure of the regulator Secondary pressure of the regulator	 0.98 MPa or more 0.78 MPa during machine operation	(**Note 1**)	—
3	Air supply pressure	0.49 MPa during machine operation	Air supply port regulator	—
4	Cooling water amount	Within the specified limits	Chiller unit	Maintenance Manual 8-3, Maintenance Manual of the chiller unit
5	Cooling water pressure	Check the pressure. (**Note 2**) (When the laser operation switch is ON)	Chiller unit	Maintenance Manual 7-3 and 8-3, Maintenance Manual of the chiller unit
6	Set-point of cooling water temperature	17.5°C (63.5°F)	Chiller unit	Maintenance Manual of the chiller unit
7	Contamination on air filter	To be free of dust and dirt.	Chiller unit	Maintenance Manual of the chiller unit
8	Contamination on condenser	To be free of dust and dirt.	Chiller unit	Maintenance Manual of the chiller unit
9	Color of the indicator	Blue is normal. (When the indicator color is pink or white, inspect or replace the indicator.)	Chiller unit	Maintenance Manual of the chiller unit
10	Contamination on micro mist filter	Inspect and replace the filter if required.	Chiller unit	Maintenance Manual of the chiller unit
11	Vacuum pump oil level	Within the allowable limits when the laser operation switch is OFF.	Laser power supply unit	Maintenance Manual 7-1
12	Turbo blower oil level	Within the allowable limits when the laser operation switch is OFF.	Laser power supply unit	Maintenance Manual 7-2
13	Mechanical booster oil level	Within the allowable limits when the laser operation switch is OFF.	Laser power supply unit	Maintenance Manual 7-2
14	Laser oscillation conditions	Power indication as specified, visual check of correct emission.	Through sight window	Contact Mazak Technical Center or Technology Center.
15	Nozzle	To be free of dross. Nozzle hole to be free of deformation.	Torch	—
16	Knife edges with their supporting brackets	Wear of knife edges must be less than 3 mm (0.12 in). (**Note 3**)	Table	Maintenance Manual 4-2

No.	Inspection items	Contents	Remark	Reference section
17	Table protective plate	Replace the plate if it is deformed. (Replace the plate before it affects the operation of the worksheet lifter or 2-pallet changer.) (**Note 3**)	Table	Maintenance Manual 4-2
18	Contamination on air filter (Machine)	Red spots must not appear on the filter.		Maintenance Manual 7-8
19	Chip bucket	Remove the material deposited in the chip bucket as frequently as possible.	(**Note 4**)	—

Note 1: With the exception of the high-pressure gas (0.59 MPa or more), set the assist gas supply pressure (on the secondary side of the regulator) to 0.78 MPa. The setting must be done while actually supplying the assist gas.

Note 2: The setting of the cooling water pressure from the chiller unit differs according to the particular output of the oscillator and frequency used in the area.

<50 Hz/60 Hz area>

Laser output	Initial water pressure value	Water pressure value that requires the cleaning of the cooling water circuit (chiller unit and oscillator)
2.5 kW	0.34 MPa	0.44 MPa
4 kW	0.40 MPa	

Note: After cleaning, reduce the water pressure to its initial value.

<60 Hz area>

Laser output	Initial water pressure value	Water pressure value that requires the cleaning of the cooling water circuit (chiller unit and oscillator)
1.8 kW	0.40 MPa	0.44 MPa
2.5 kW	0.34 MPa	
4 kW	0.40 MPa	

Note: Do not change the value that was set during bypass valve installation.

<50 Hz area>

Laser output	Initial water pressure value	Water pressure value that requires the cleaning of the cooling water circuit (chiller unit and oscillator)
1.8 kW	0.34 MPa	0.40 MPa
2.5 kW	0.25 MPa	0.34 MPa
4 kW	0.30 MPa	

Note: Do not change the value that was set during bypass valve installation.

Note 3: Knife edges with their brackets and table protective plates (of the type and dimensions as required for the particular machine) may be manufactured by the user referring to the following drawings in Section 4-2. The table preceding the drawings enumerates the relevant parts with their required quantity for the particular type and specification of machine.

Note 4: Immediately remove the chips produced during non-oxidation cutting (e.g., machining of an aluminum plate using Nitrogen gas). Otherwise, the chips may react with the moisture in the air, producing heat and catching fire.

4-2 Table Assembly Drawing and Component Parts

1. Standard/Laser FMS

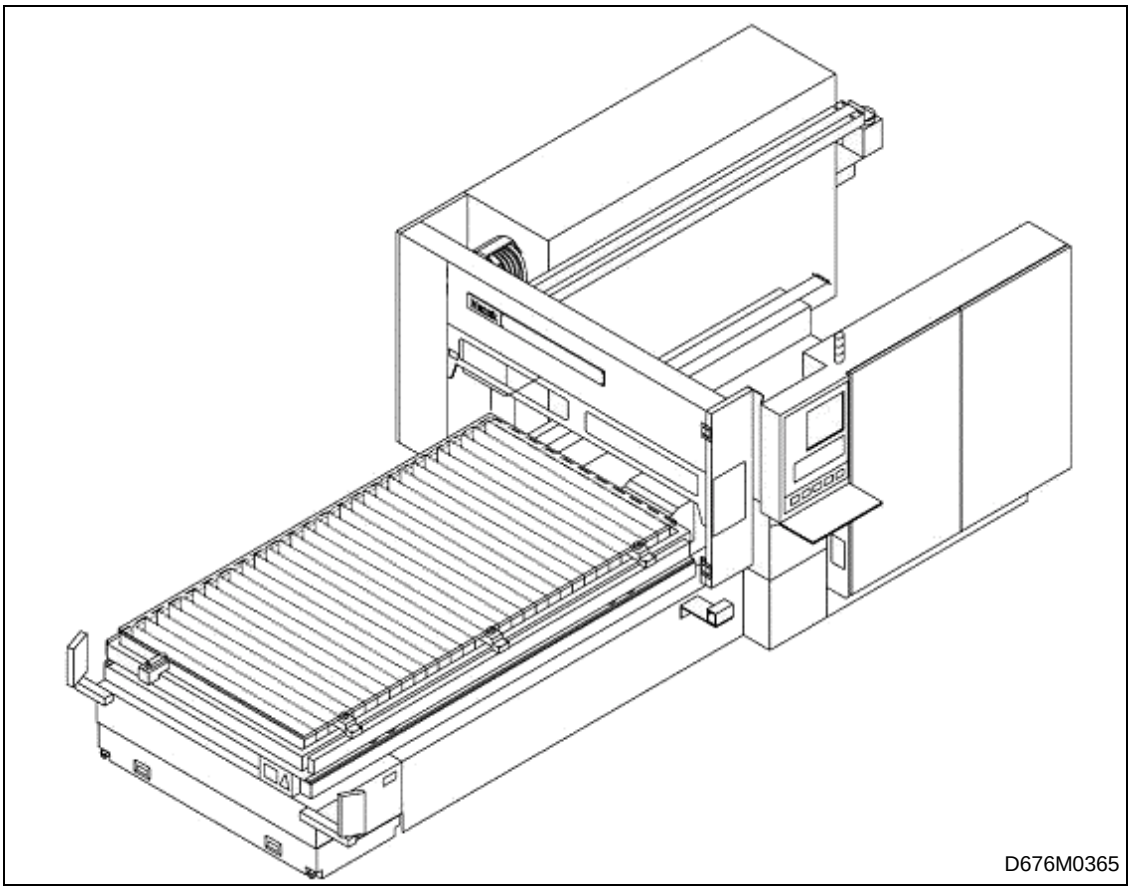


Fig. 4-1 General view

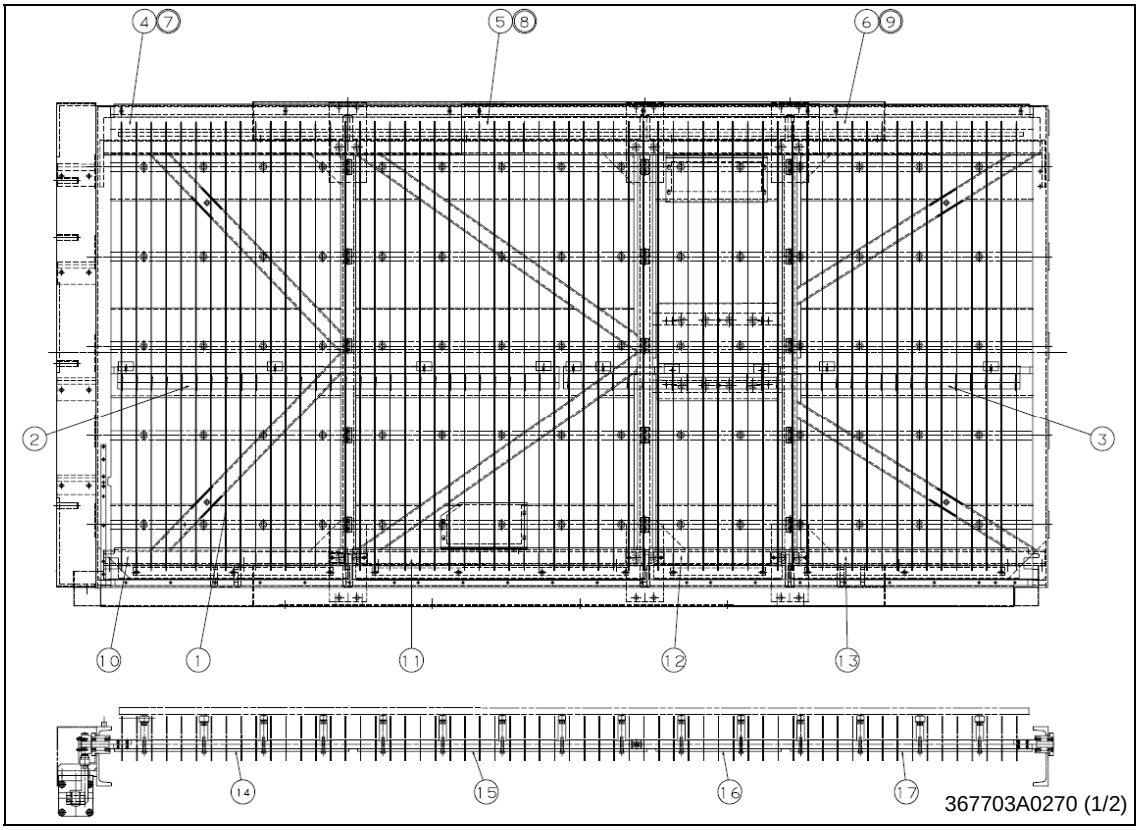


Fig. 4-2 Table assembly drawing [1] (ST-X510 MkIII) Parts for knife edge - STD/FMS -

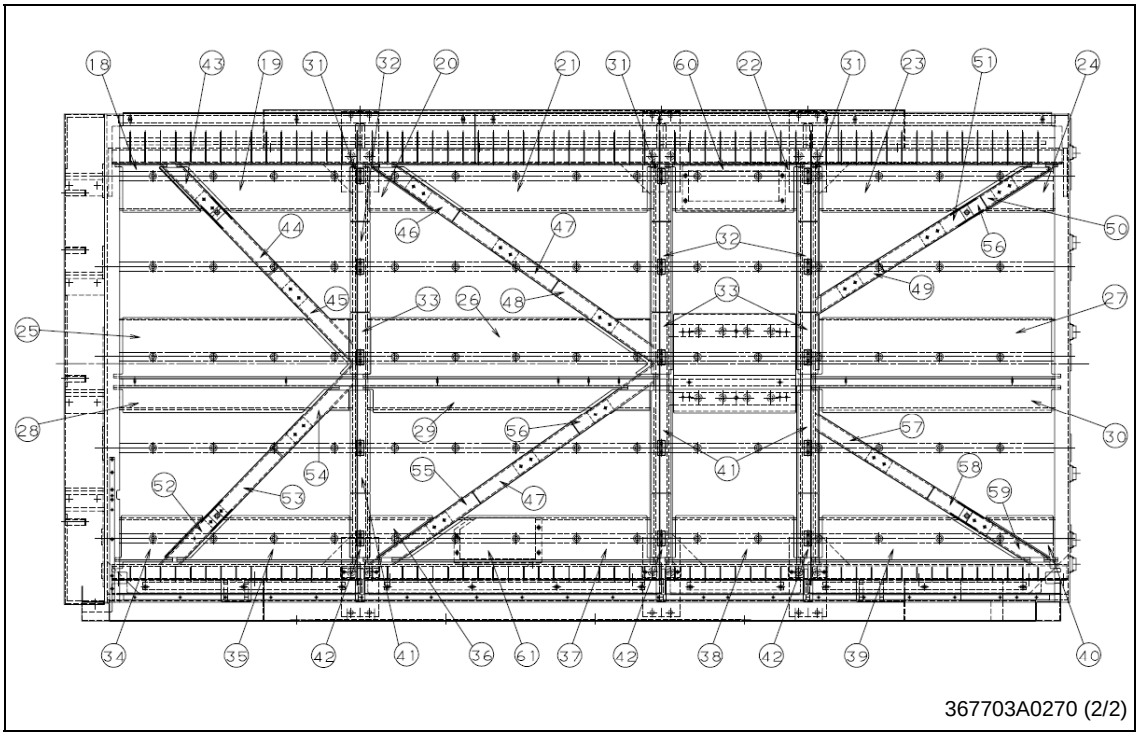


Fig. 4-3 Table assembly drawing [2] (ST-X510 MkIII) Protective plate - STD/FMS -

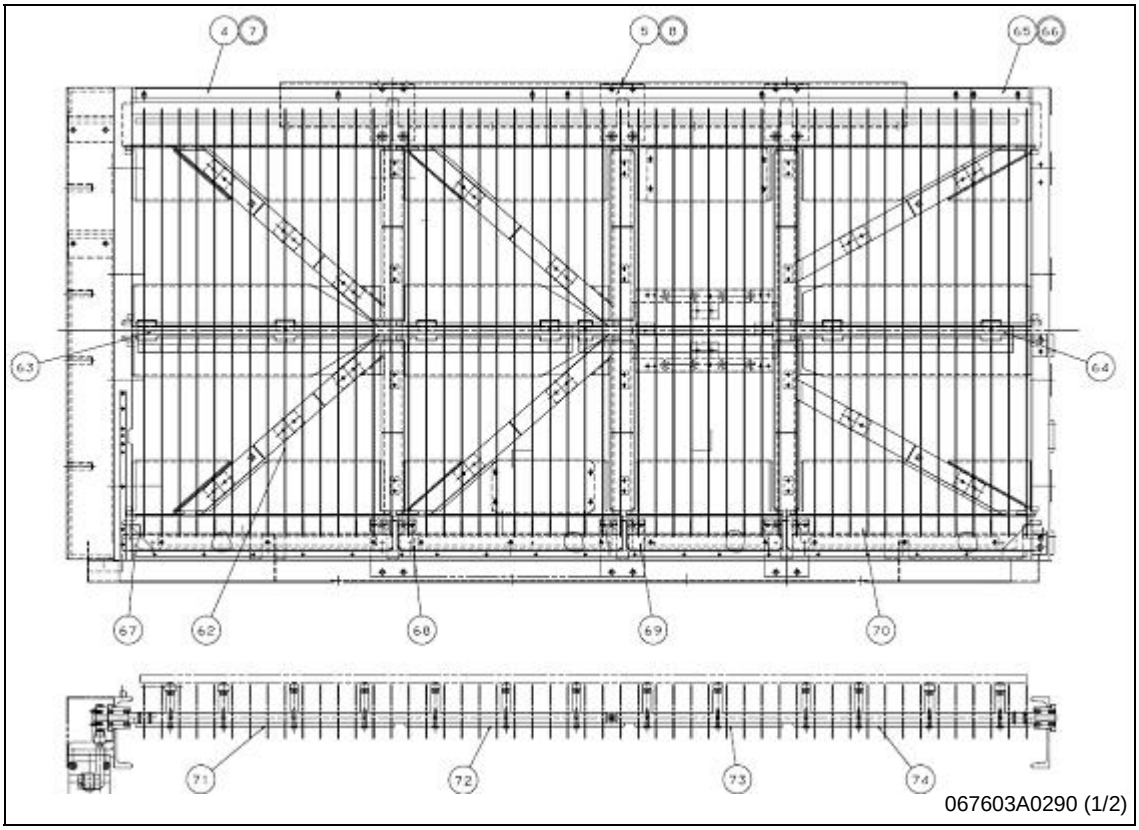


Fig. 4-4 Table assembly drawing [1] (ST-X48 MkIII) Parts for knife edge - STD/FMS -

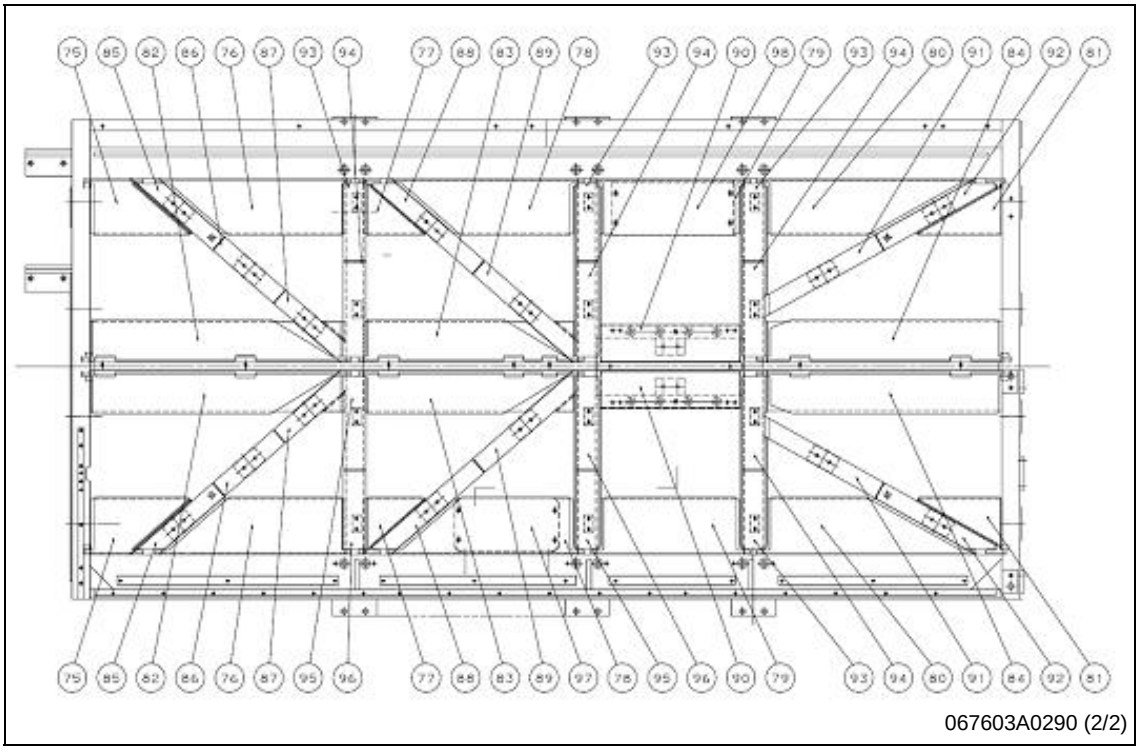


Fig. 4-5 Table assembly drawing [2] (ST-X48 MkIII) Protective plate - STD/FMS -

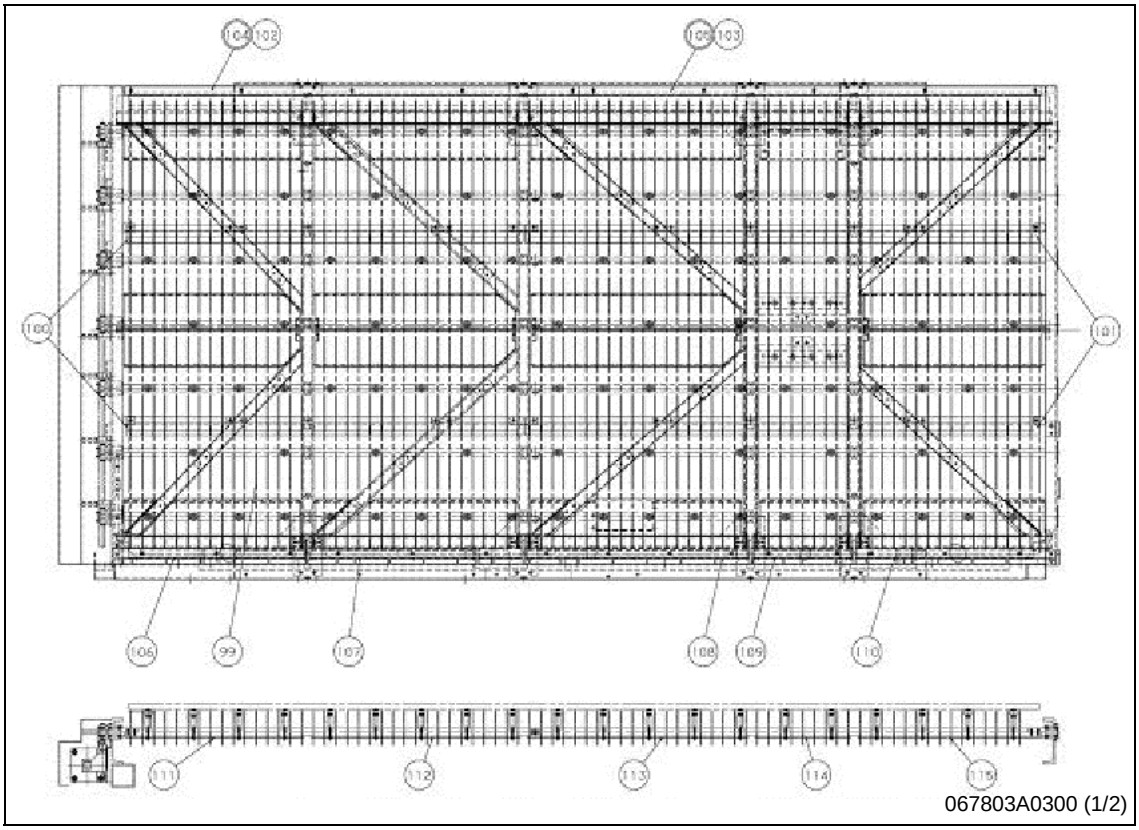


Fig. 4-6 Table assembly drawing [1] (ST-X612 MkIII) Parts for knife edge - STD/FMS -

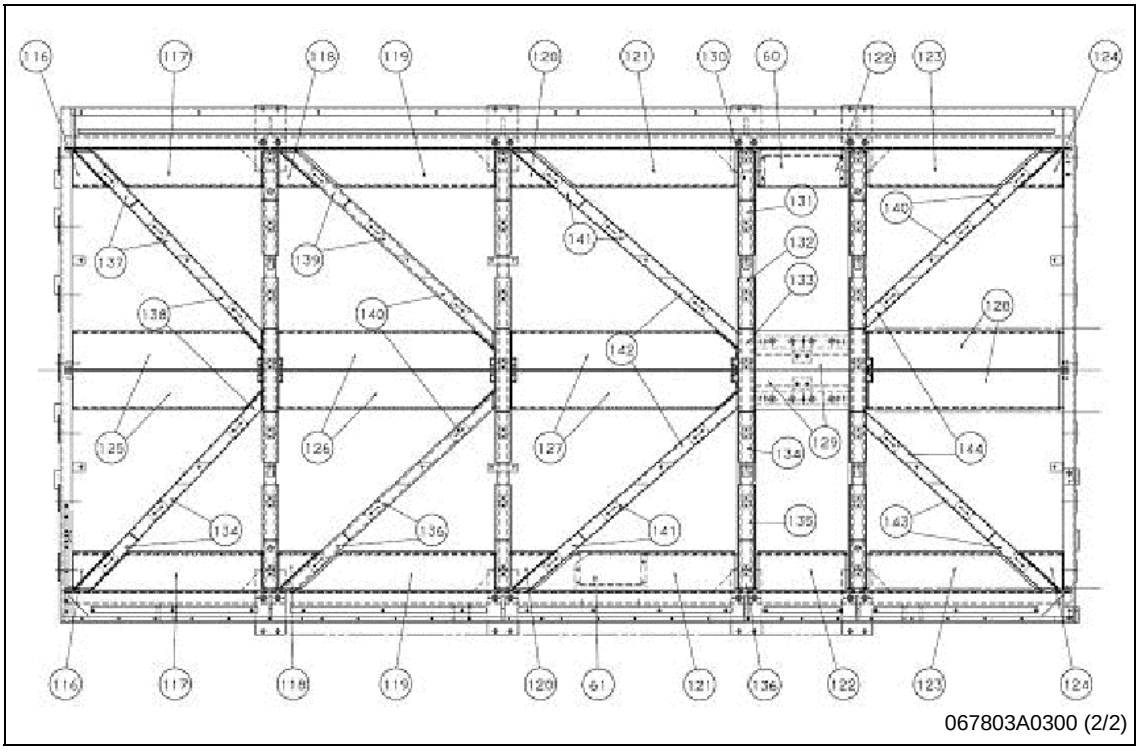


Fig. 4-7 Table assembly drawing [2] (ST-X612 MkIII) Protective plate - STD/FMS -

Table 4-2 Table of parts (ST-X48/510/612 MkIII)

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard	Laser FMS	Standard	Laser FMS	Standard	Laser FMS	
1	36770305661	Knife edge	—	—	31*(61)	61	—	—	Knife edge (for 510)
2	16770305310	Bracket	—	—	1	1	—	—	Knife edge supporting bracket (510, Center [1])
3	16770305320	Bracket	—	—	1	1	—	—	Knife edge supporting bracket (510, Center [2])
4	26770303890	Bracket	—	—	1	—	—	—	Knife edge supporting bracket (48/510, Rear [1])
5	26770303900	Bracket	—	—	1	—	—	—	Knife edge supporting bracket (48/510, Rear [2])
6	26770303910	Bracket	—	—	1	—	—	—	Knife edge supporting bracket (510, Rear [3])
7	26770301520	Bracket	—	—	—	1	—	—	Knife edge supporting bracket (48/510, Rear [1])
8	26770301530	Bracket	—	—	—	1	—	—	Knife edge supporting bracket (48/510, Rear [2])
9	26770301540	Bracket	—	—	—	1	—	—	Knife edge supporting bracket (510, Rear [3])
10	26770303920	Cover	—	—	1	1	—	—	Knife edge supporting bracket (510, Front [1])
11	26770303930	Cover	—	—	1	1	—	—	Knife edge supporting bracket (510, Front [2])
12	26770303940	Cover	—	—	1	1	—	—	Knife edge supporting bracket (510, Front [3])
13	26770303950	Cover	—	—	1	1	—	—	Knife edge supporting bracket (510, Front [4])
14	46775100690	Bar	—	—	5	5	—	—	Worksheet lifter protective plate
15	46775100700	Bar	—	—	5	5	—	—	Worksheet lifter protective plate
16	46775100710	Bar	—	—	5	5	—	—	Worksheet lifter protective plate
17	46775100720	Bar	—	—	5	5	—	—	Worksheet lifter protective plate
18	46770310750	Plate (t9)	—	—	1	1	—	—	Table protective plate
19	46770310760	Plate (t9)	—	—	1	1	—	—	Table protective plate
20	46770310770	Plate (t9)	—	—	1	1	—	—	Table protective plate
21	46770310780	Plate (t9)	—	—	1	1	—	—	Table protective plate
22	46770310790	Plate (t9)	—	—	1	1	—	—	Table protective plate
23	46770310800	Plate (t9)	—	—	1	1	—	—	Table protective plate
24	46770310811	Plate (t9)	—	—	1	1	—	—	Table protective plate
25	46770310821	Plate (t9)	—	—	1	1	—	—	Table protective plate
26	46770310831	Plate (t9)	—	—	1	1	—	—	Table protective plate
27	46770310841	Plate (t9)	—	—	1	1	—	—	Table protective plate

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard	Laser FMS	Standard	Laser FMS	Standard	Laser FMS	
28	46770310851	Plate (t9)	—	—	1	1	—	—	Table protective plate
29	46770310861	Plate (t9)	—	—	1	1	—	—	Table protective plate
30	46770310871	Plate (t9)	—	—	1	1	—	—	Table protective plate
31	46770310880	Plate (t9)	—	—	3	3	—	—	Table protective plate
32	46770310890	Plate (t9)	—	—	3	3	—	—	Table protective plate
33	46770310900	Plate (t9)	—	—	3	3	—	—	Table protective plate
34	46770310910	Plate (t9)	—	—	1	1	—	—	Table protective plate
35	46770310920	Plate (t9)	—	—	1	1	—	—	Table protective plate
36	46770310931	Plate (t9)	—	—	1	1	—	—	Table protective plate
37	46770310940	Plate (t9)	—	—	1	1	—	—	Table protective plate
38	46770310950	Plate (t9)	—	—	1	1	—	—	Table protective plate
39	46770310960	Plate (t9)	—	—	1	1	—	—	Table protective plate
40	46770310970	Plate (t9)	—	—	1	1	—	—	Table protective plate
41	46770310980	Plate (t9)	—	—	3	3	—	—	Table protective plate
42	46770310990	Plate (t9)	—	—	3	3	—	—	Table protective plate
43	46770311220	Plate (t9)	—	—	1	1	—	—	Table protective plate
44	46770311230	Plate (t9)	—	—	1	1	—	—	Table protective plate
45	46770311240	Plate (t9)	—	—	1	1	—	—	Table protective plate
46	46770311020	Plate (t9)	—	—	1	1	—	—	Table protective plate
47	46770311030	Plate (t9)	—	—	3	3	—	—	Table protective plate
48	46770311040	Plate (t9)	—	—	1	1	—	—	Table protective plate
49	46770311050	Plate (t9)	—	—	1	1	—	—	Table protective plate
50	46770311250	Plate (t9)	—	—	1	1	—	—	Table protective plate
51	46770311260	Plate (t9)	—	—	1	1	—	—	Table protective plate
52	46770311300	Plate (t9)	—	—	1	1	—	—	Table protective plate
53	46770311310	Plate (t9)	—	—	1	1	—	—	Table protective plate
54	46770311320	Plate (t9)	—	—	1	1	—	—	Table protective plate
55	46770311090	Plate (t9)	—	—	1	1	—	—	Table protective plate

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard	Laser FMS	Standard	Laser FMS	Standard	Laser FMS	
56	46770311100	Plate (t9)	—	—	1	1	—	—	Table protective plate
57	46770311290	Plate (t9)	—	—	1	1	—	—	Table protective plate
58	46770311280	Plate (t9)	—	—	1	1	—	—	Table protective plate
59	46770311270	Plate (t9)	—	—	1	1	—	—	Table protective plate
60	46770311131	Plate (t2.3)	—	—	1	1	1	1	Table protective plate (Cable box cover)
61	46770311140	Plate (t2.3)	—	—	1	1	1	1	Table protective plate (Zero point dog adjuster cover)
62	36760305651	Knife edge	25*(50)	50	—	—	—	—	Knife edge (for 48)
63	16760304090	Bracket	1	1	—	—	—	—	Knife edge supporting bracket (48, Center [1])
64	16760304101	Bracket	1	1	—	—	—	—	Knife edge supporting bracket (48, Center [2])
65	36760301950	Bracket	1	—	—	—	—	—	Knife edge supporting bracket (48, Rear [3])
66	36760301940	Bracket	—	1	—	—	—	—	Knife edge supporting bracket (48, Rear [3])
67	26760304120	Cover	1	1	—	—	—	—	Knife edge supporting bracket (48, Front [1])
68	26760304130	Cover	1	1	—	—	—	—	Knife edge supporting bracket (48, Front [2])
69	26760304140	Cover	1	1	—	—	—	—	Knife edge supporting bracket (48, Front [3])
70	26760304150	Cover	1	1	—	—	—	—	Knife edge supporting bracket (48, Front [4])
71	46765100760	Bar	4	4	—	—	—	—	Worksheet lifter protective plate
72	46765100770	Bar	4	4	—	—	—	—	Worksheet lifter protective plate
73	46765100780	Bar	4	4	—	—	—	—	Worksheet lifter protective plate
74	46765100790	Bar	4	4	—	—	—	—	Worksheet lifter protective plate
75	46760311590	Plate (t9)	2	2	—	—	—	—	Table protective plate
76	46760311600	Plate (t9)	2	2	—	—	—	—	Table protective plate
77	46760311610	Plate (t9)	2	2	—	—	—	—	Table protective plate
78	46760311620	Plate (t9)	2	2	—	—	—	—	Table protective plate
79	46760311630	Plate (t9)	2	2	—	—	—	—	Table protective plate
80	46760311640	Plate (t9)	2	2	—	—	—	—	Table protective plate
81	46760311650	Plate (t9)	2	2	—	—	—	—	Table protective plate
82	46760311660	Plate (t9)	2	2	—	—	—	—	Table protective plate
83	46760311670	Plate (t9)	2	2	—	—	—	—	Table protective plate

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard	Laser FMS	Standard	Laser FMS	Standard	Laser FMS	
84	46760311680	Plate (t9)	2	2	—	—	—	—	Table protective plate
85	46760311720	Plate (t9)	2	2	—	—	—	—	Table protective plate
86	46760311730	Plate (t9)	2	2	—	—	—	—	Table protective plate
87	46760311740	Plate (t9)	2	2	—	—	—	—	Table protective plate
88	46760311750	Plate (t9)	2	2	—	—	—	—	Table protective plate
89	46760311760	Plate (t9)	2	2	—	—	—	—	Table protective plate
90	46760311770	Plate (t9)	2	2	—	—	—	—	Table protective plate
91	46760311780	Plate (t9)	2	2	—	—	—	—	Table protective plate
92	46760311790	Plate (t9)	2	2	—	—	—	—	Table protective plate
93	46760311800	Plate (t9)	3	3	—	—	—	—	Table protective plate
94	46760311810	Plate (t9)	3	3	—	—	—	—	Table protective plate
95	46760311820	Plate (t9)	3	3	—	—	—	—	Table protective plate
96	46760311830	Plate (t9)	3	3	—	—	—	—	Table protective plate
97	36760311420	Cover(t2.3)	1	1	—	—	—	—	Table protective plate (Cable box cover)
98	36760311430	Cover(t2.3)	1	1	—	—	—	—	Table protective plate (Zero point dog adjuster cover)
99	36780305671	Knife edge	—	—	—	—	80	80	Knife edge (for 612)
100	16780311520	Bracket	—	—	—	—	2	2	Knife edge supporting bracket (612, Center [1])
101	16780311530	Bracket	—	—	—	—	2	2	Knife edge supporting bracket (612, Center [2])
102	16780302140	Bracket	—	—	—	—	1	—	Knife edge supporting bracket (612, Rear [1])
103	16780302150	Bracket	—	—	—	—	1	—	Knife edge supporting bracket (612, Rear [2])
104	16780302160	Bracket	—	—	—	—	—	1	Knife edge supporting bracket (612, Rear [1])
105	16780302170	Bracket	—	—	—	—	—	1	Knife edge supporting bracket (612, Rear [2])
106	26780311470	Cover	—	—	—	—	1	1	Knife edge supporting bracket (612, Front [1])
107	26780311480	Cover	—	—	—	—	1	1	Knife edge supporting bracket (612, Front [2])
108	26780311490	Cover	—	—	—	—	1	1	Knife edge supporting bracket (612, Front [3])
109	26780311500	Cover	—	—	—	—	1	1	Knife edge supporting bracket (612, Front [4])
110	26780311510	Cover	—	—	—	—	1	1	Knife edge supporting bracket (612, Front [5])
111	46775100460	Bar	—	—	—	—	7	7	Worksheet lifter protective plate

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard	Laser FMS	Standard	Laser FMS	Standard	Laser FMS	
112	46775100480	Bar	—	—	—	—	7	7	Worksheet lifter protective plate
113	46785100540	Bar	—	—	—	—	7	7	Worksheet lifter protective plate
114	46785100550	Bar	—	—	—	—	7	7	Worksheet lifter protective plate
115	46785100560	Bar	—	—	—	—	7	7	Worksheet lifter protective plate
116	46780312260	Plate (t9)	—	—	—	—	2	2	Table protective plate
117	46780312270	Plate (t9)	—	—	—	—	2	2	Table protective plate
118	46780312280	Plate (t9)	—	—	—	—	2	2	Table protective plate
119	46780312290	Plate (t9)	—	—	—	—	2	2	Table protective plate
120	46780312300	Plate (t9)	—	—	—	—	2	2	Table protective plate
121	46780312310	Plate (t9)	—	—	—	—	2	2	Table protective plate
122	46780312320	Plate (t9)	—	—	—	—	2	2	Table protective plate
123	46780312330	Plate (t9)	—	—	—	—	2	2	Table protective plate
124	46780312340	Plate (t9)	—	—	—	—	2	2	Table protective plate
125	46780312350	Plate (t9)	—	—	—	—	2	2	Table protective plate
126	46780312360	Plate (t9)	—	—	—	—	2	2	Table protective plate
127	46780312370	Plate (t9)	—	—	—	—	2	2	Table protective plate
128	46780312380	Plate (t9)	—	—	—	—	2	2	Table protective plate
129	46780312390	Plate (t9)	—	—	—	—	2	2	Table protective plate
130	46780312400	Plate (t9)	—	—	—	—	4	4	Table protective plate
131	46780312410	Plate (t9)	—	—	—	—	4	4	Table protective plate
132	46780312420	Plate (t9)	—	—	—	—	4	4	Table protective plate
133	46780312430	Plate (t9)	—	—	—	—	4	4	Table protective plate
134	46780312440	Plate (t9)	—	—	—	—	4	4	Table protective plate
135	46780312450	Plate (t9)	—	—	—	—	4	4	Table protective plate
136	46780312460	Plate (t9)	—	—	—	—	4	4	Table protective plate
137	46780312470	Plate (t9)	—	—	—	—	4	4	Table protective plate
138	46780312480	Plate (t9)	—	—	—	—	2	2	Table protective plate
139	46780312490	Plate (t9)	—	—	—	—	4	4	Table protective plate

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard	Laser FMS	Standard	Laser FMS	Standard	Laser FMS	
140	46780312500	Plate (t9)	—	—	—	—	2	2	Table protective plate
141	46780312510	Plate (t9)	—	—	—	—	4	4	Table protective plate
142	46780312520	Plate (t9)	—	—	—	—	2	2	Table protective plate
143	46780312530	Plate (t9)	—	—	—	—	4	4	Table protective plate
144	46780312540	Plate (t9)	—	—	—	—	2	2	Table protective plate

*( ): for 2.5/4 kW machine

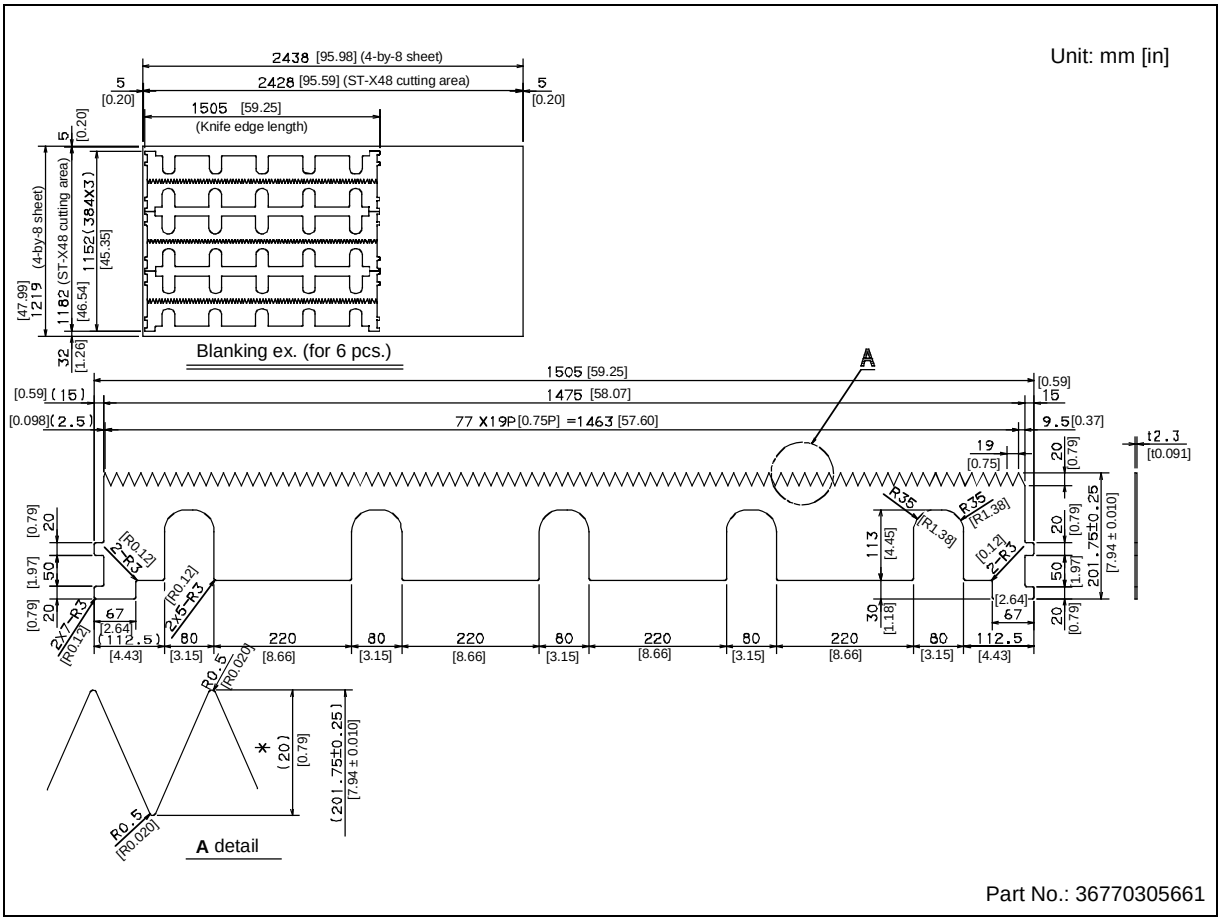


Fig. 4-8 Knife edge (No. 1)

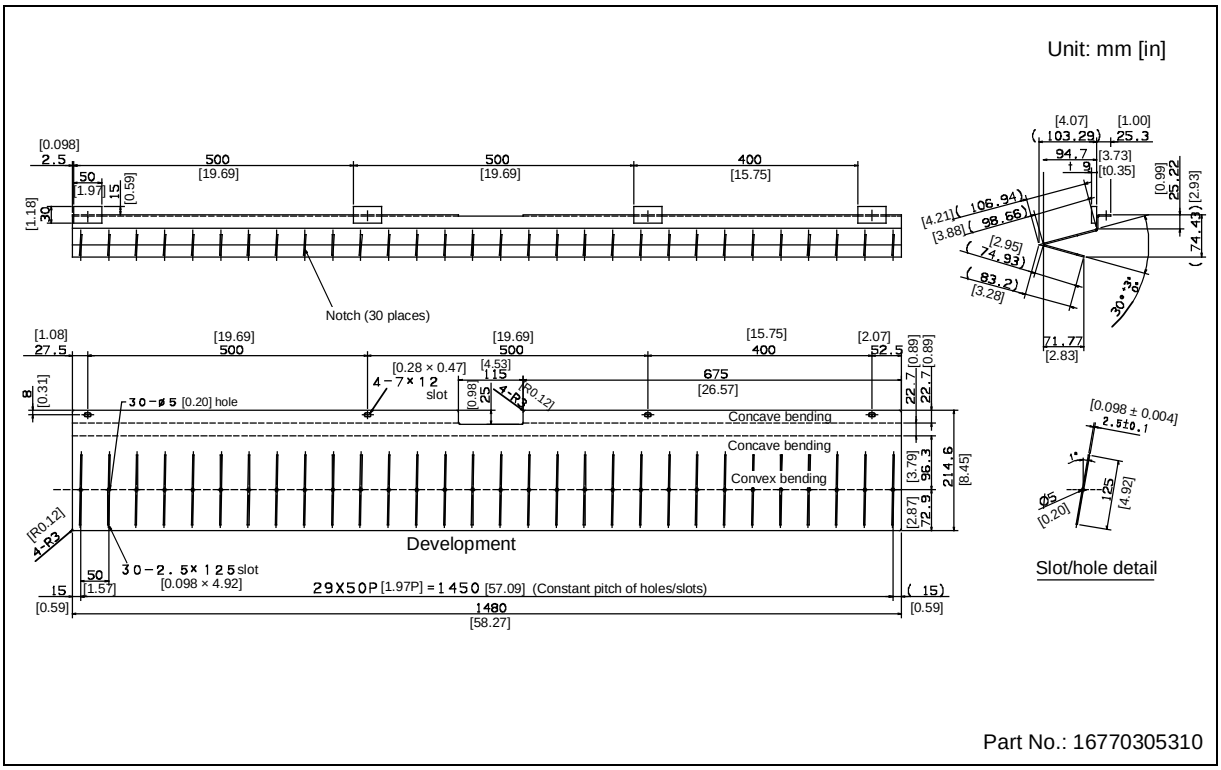


Fig. 4-9 Bracket (No. 2)

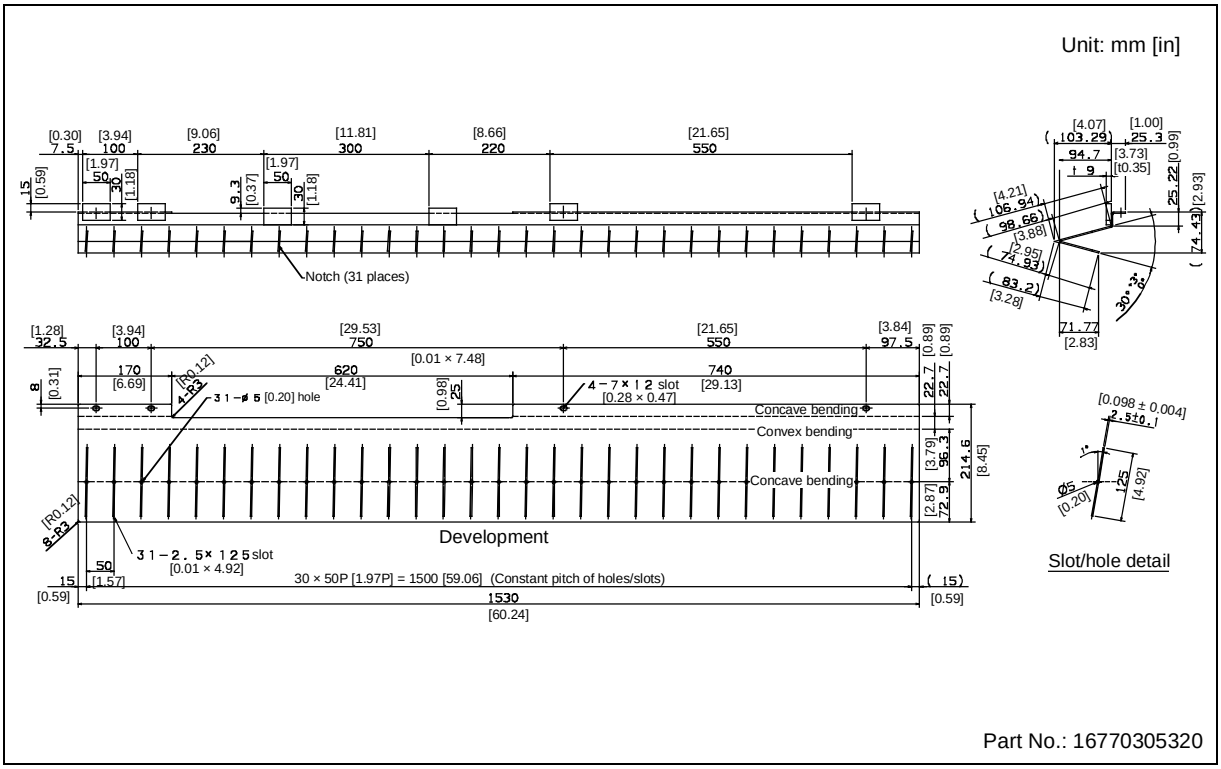


Fig. 4-10 Bracket (No. 3)

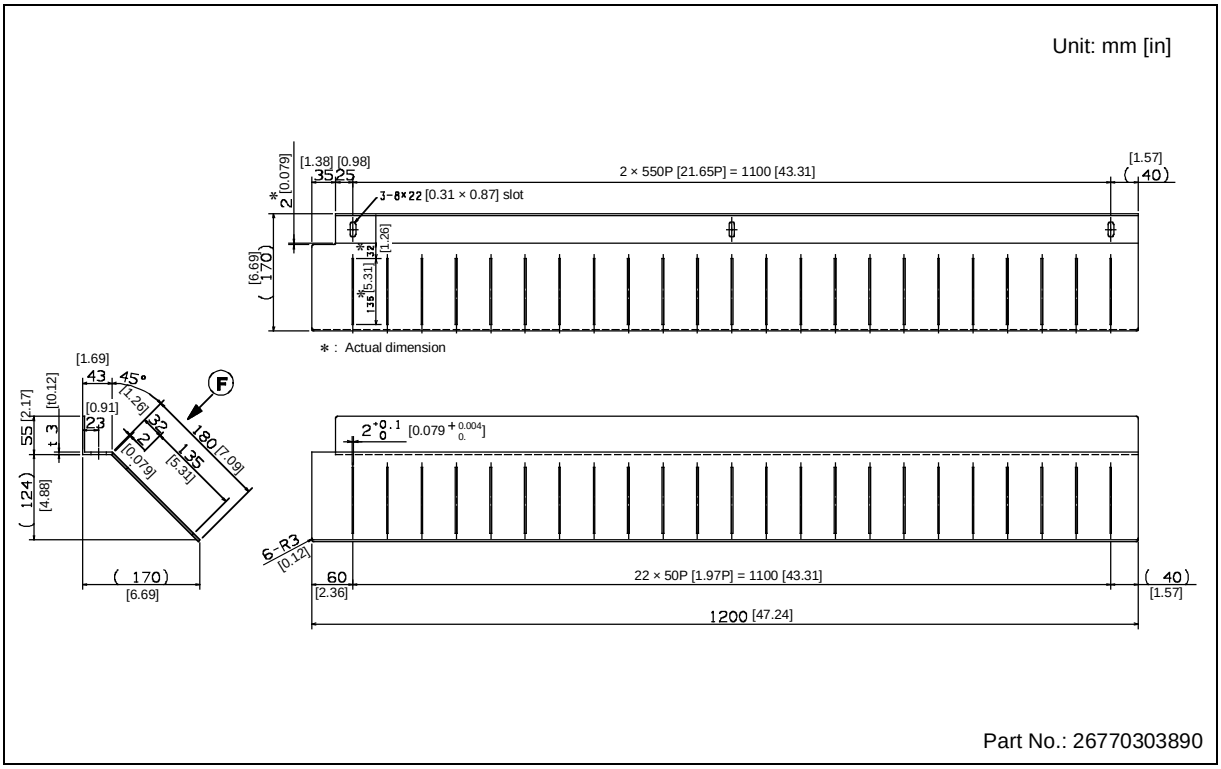


Fig. 4-11 Bracket (No. 4)

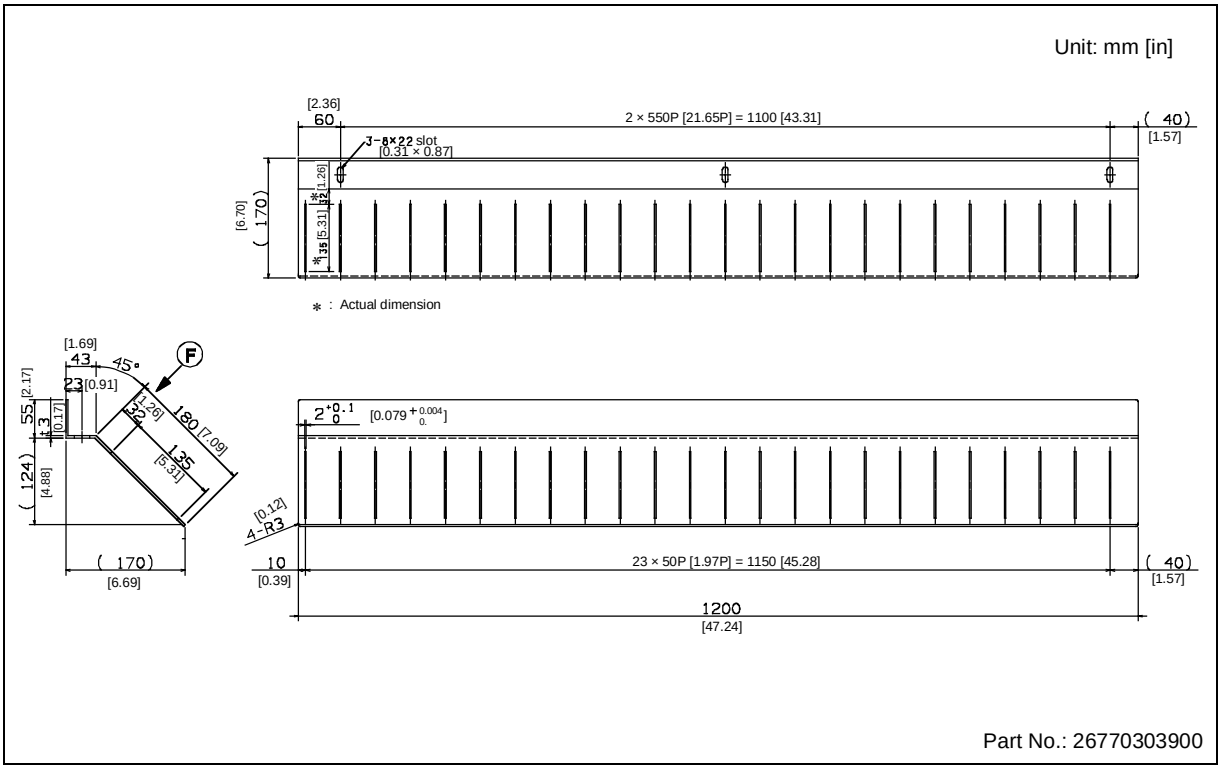


Fig. 4-12 Bracket (No. 5)

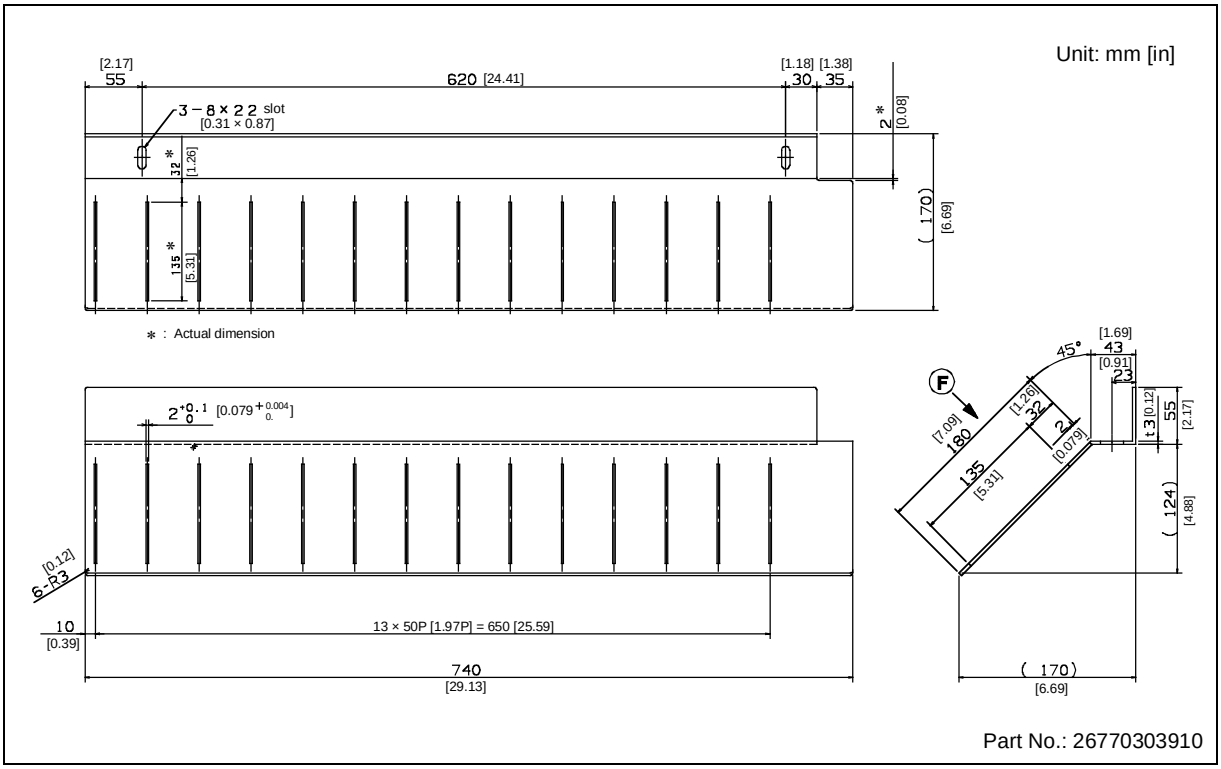


Fig. 4-13 Bracket (No. 6)

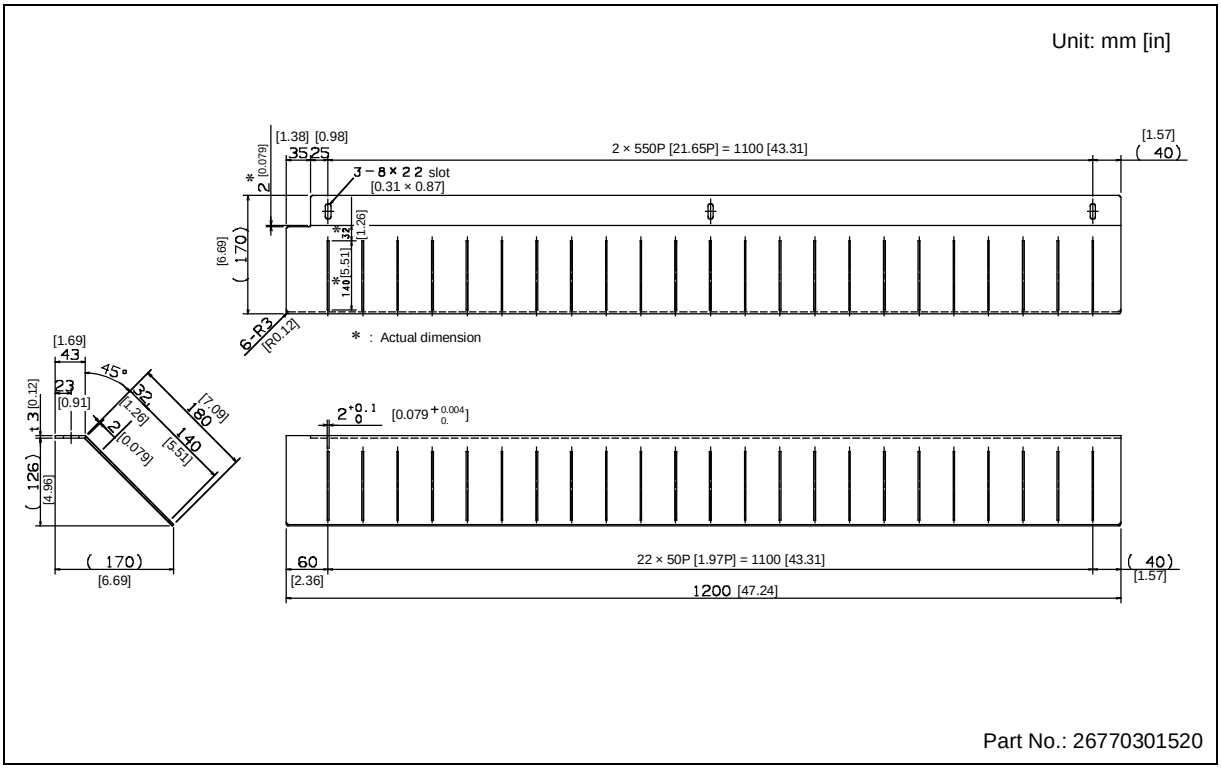


Fig. 4-14 Bracket (No. 7)

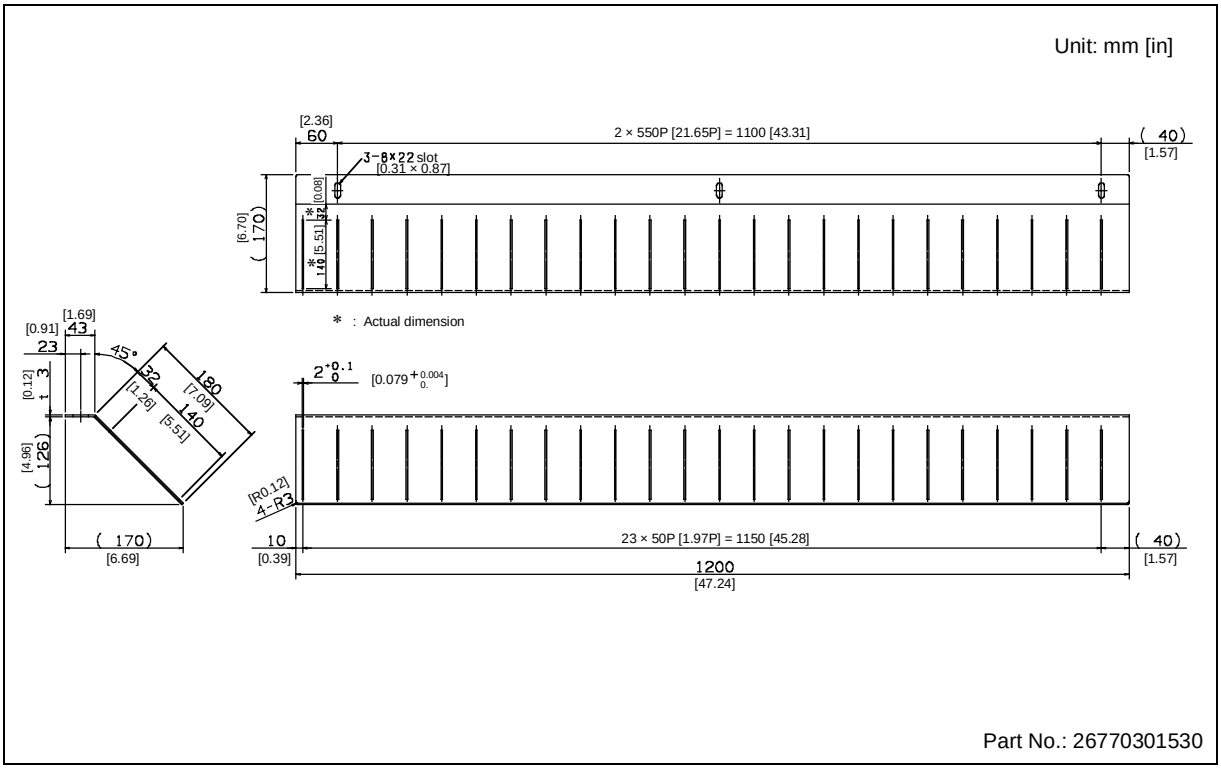


Fig. 4-15 Bracket (No. 8)

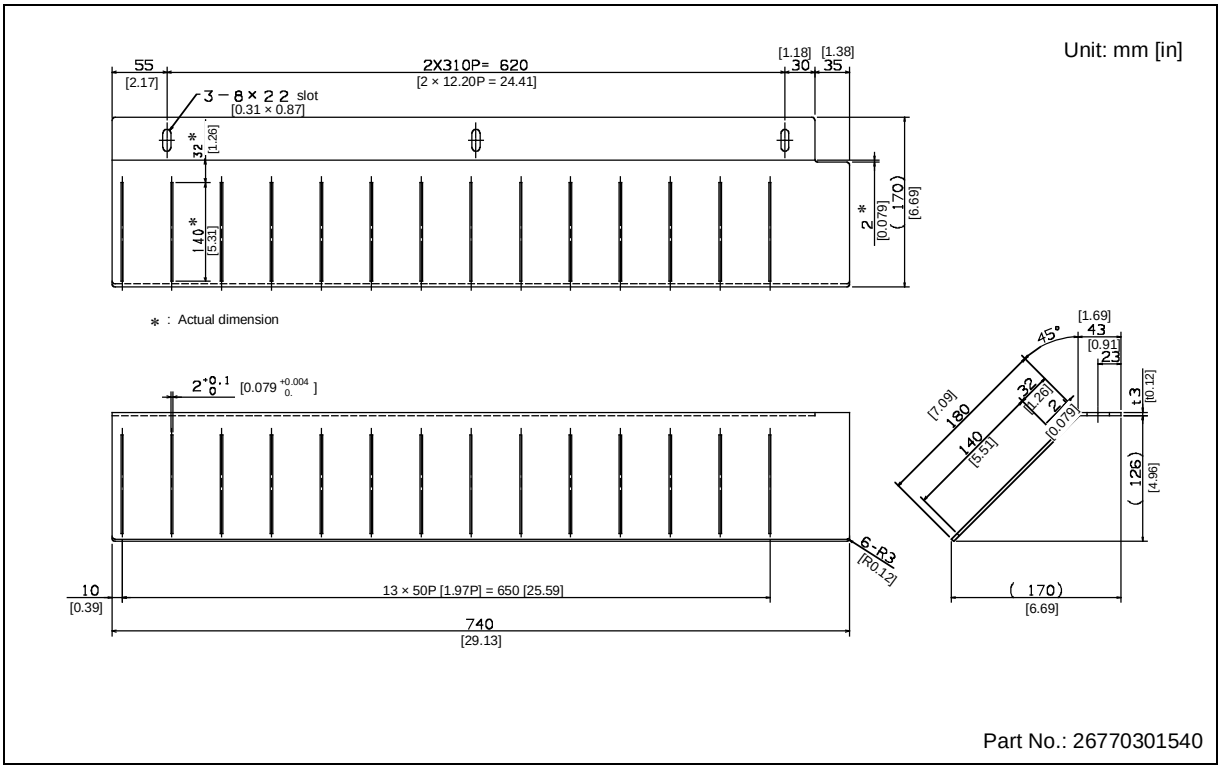


Fig. 4-16 Bracket (No. 9)

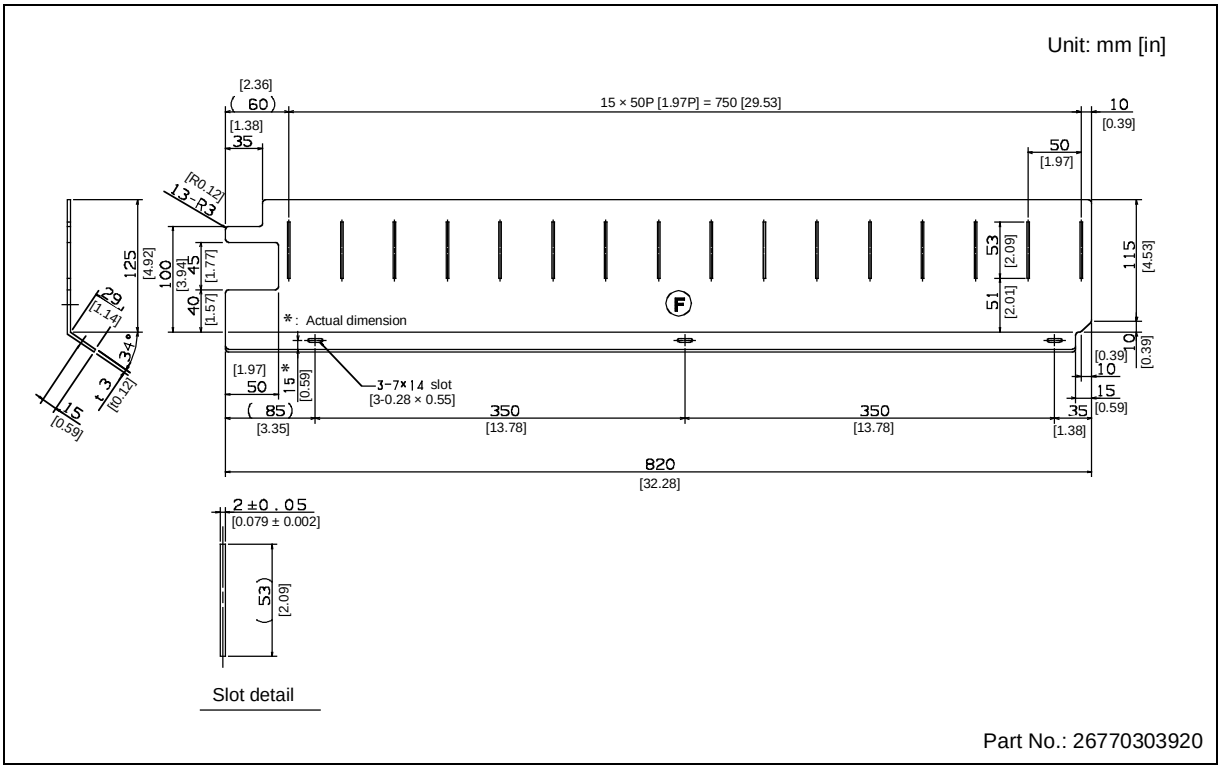


Fig. 4-17 Cover (No. 10)

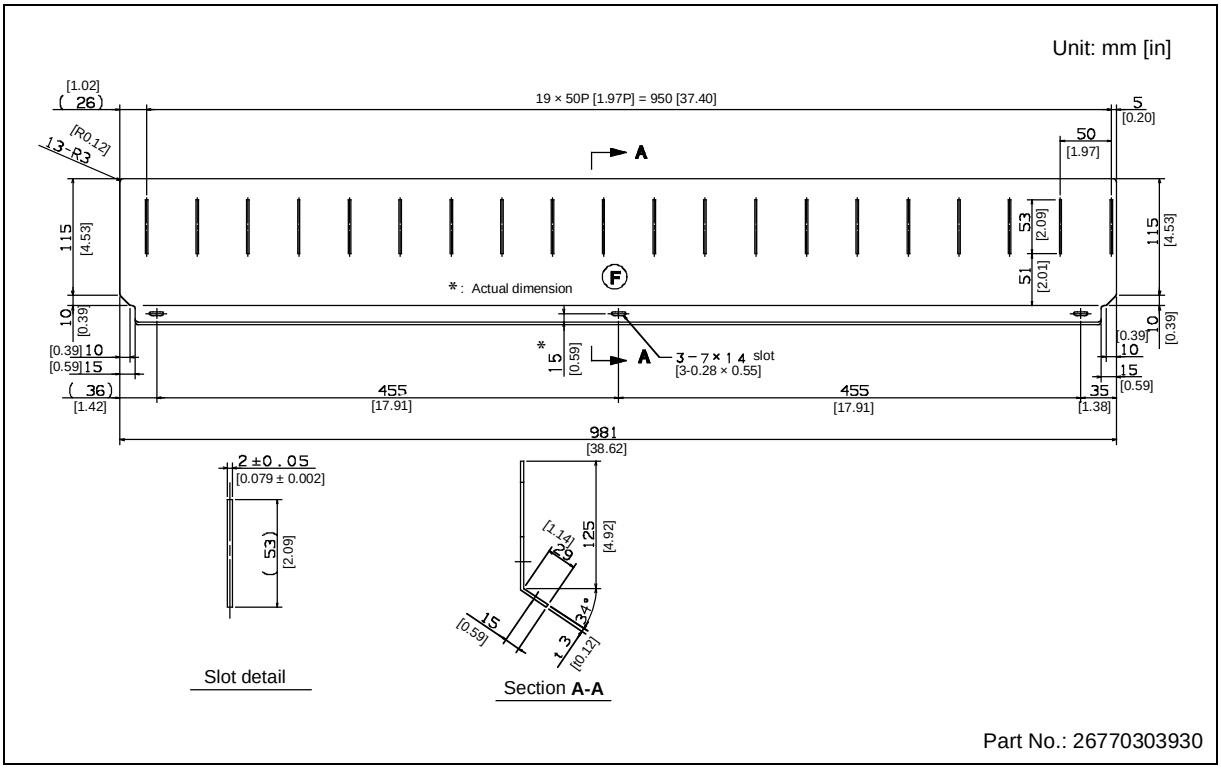


Fig. 4-18 Cover (No. 11)

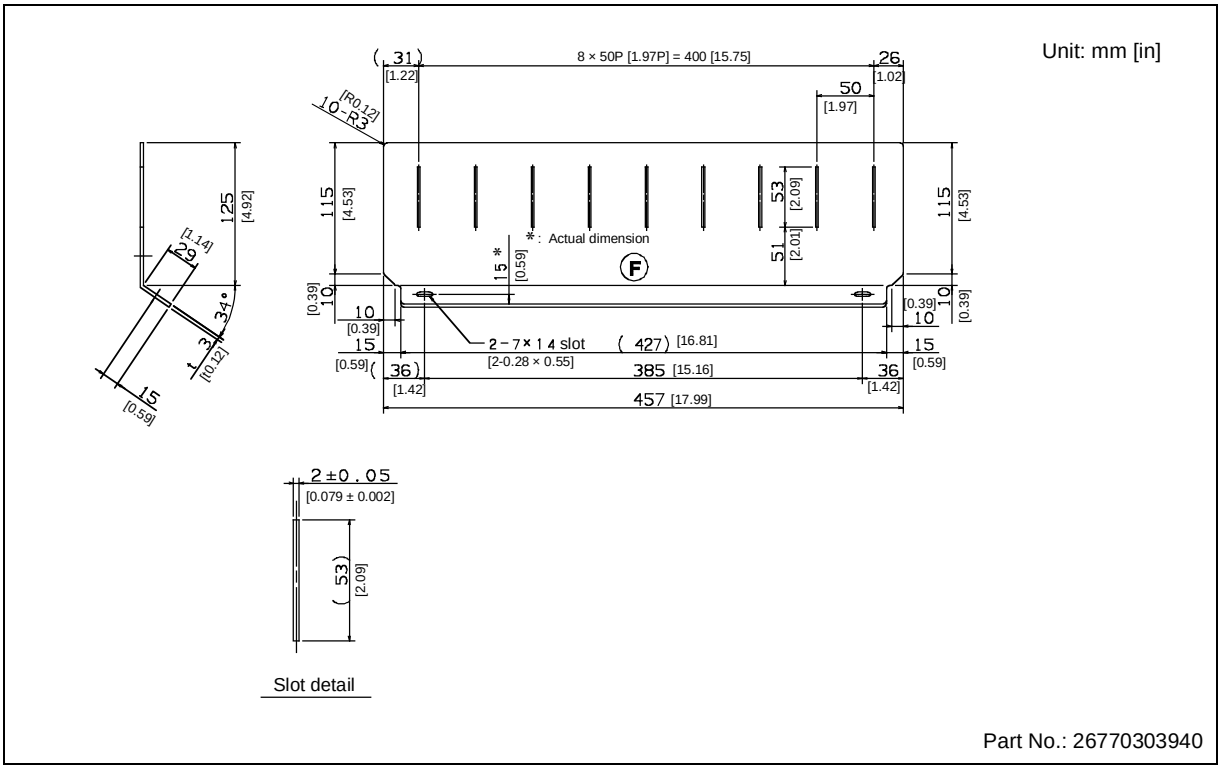


Fig. 4-19 Cover (No. 12)

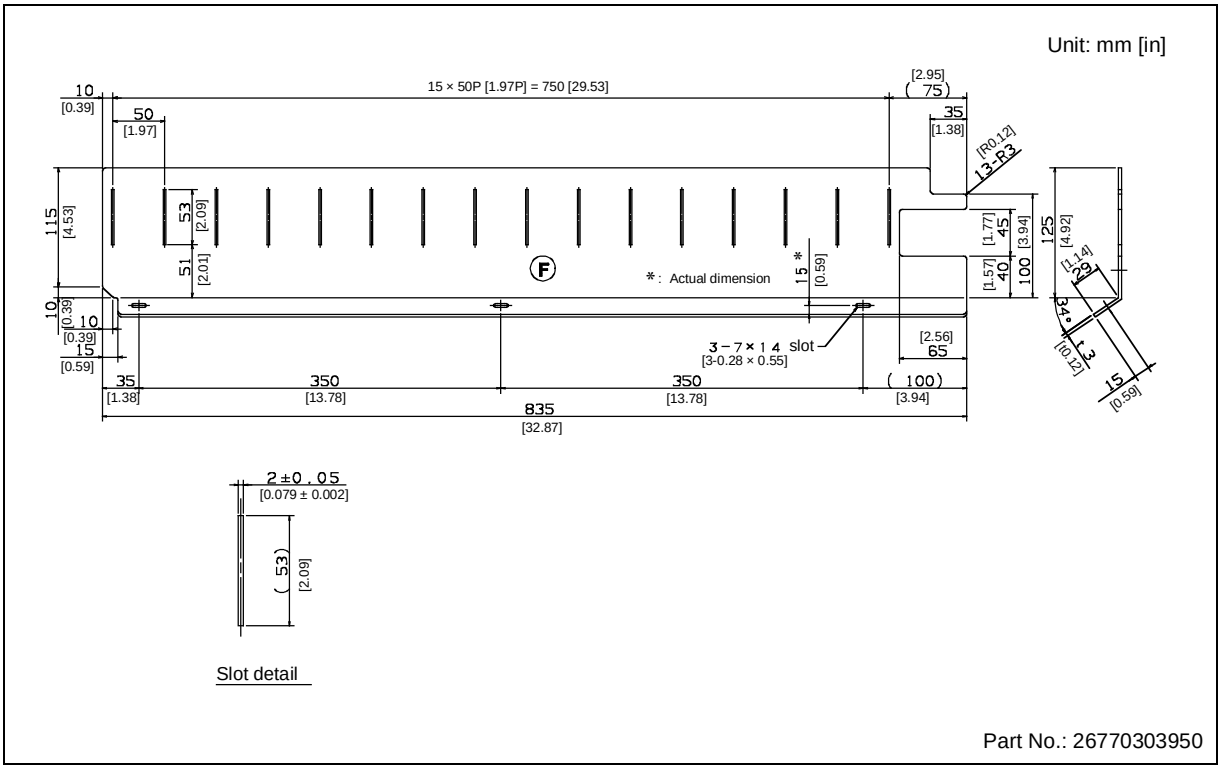


Fig. 4-20 Cover (No. 13)

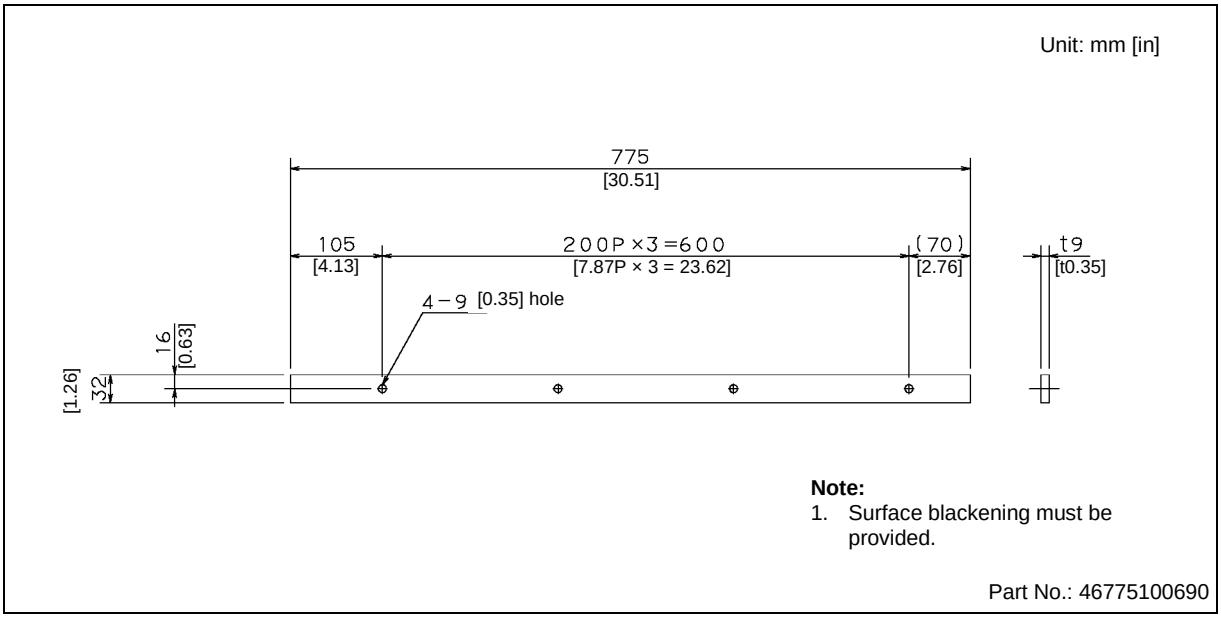
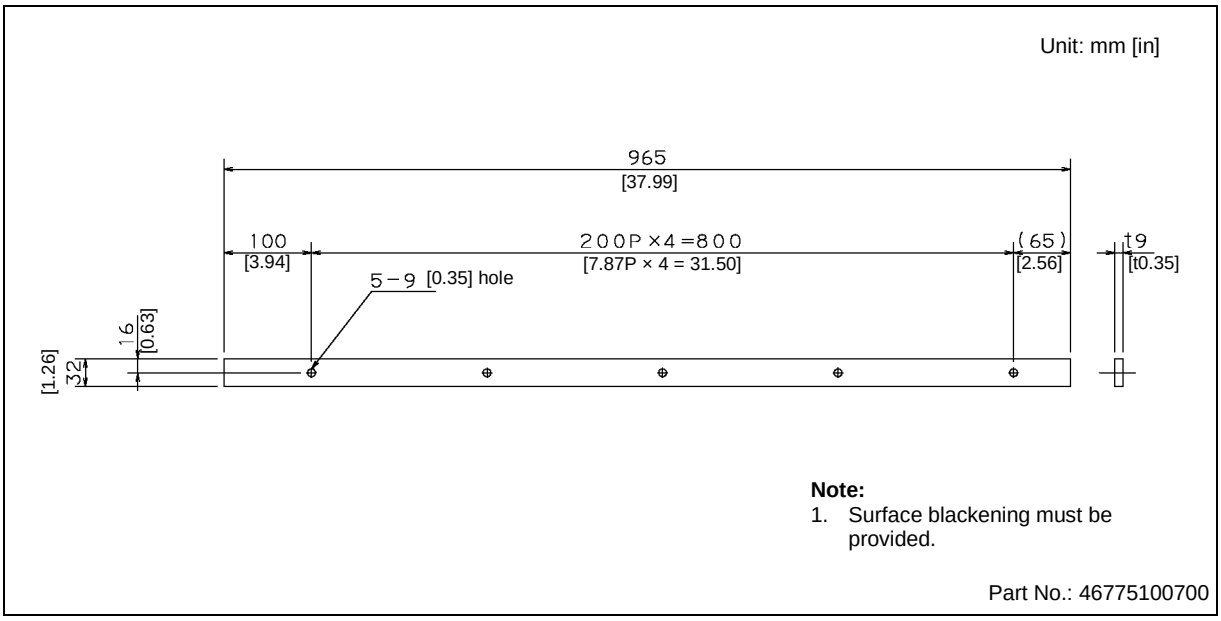


Fig. 4-21 Bar (No. 14)



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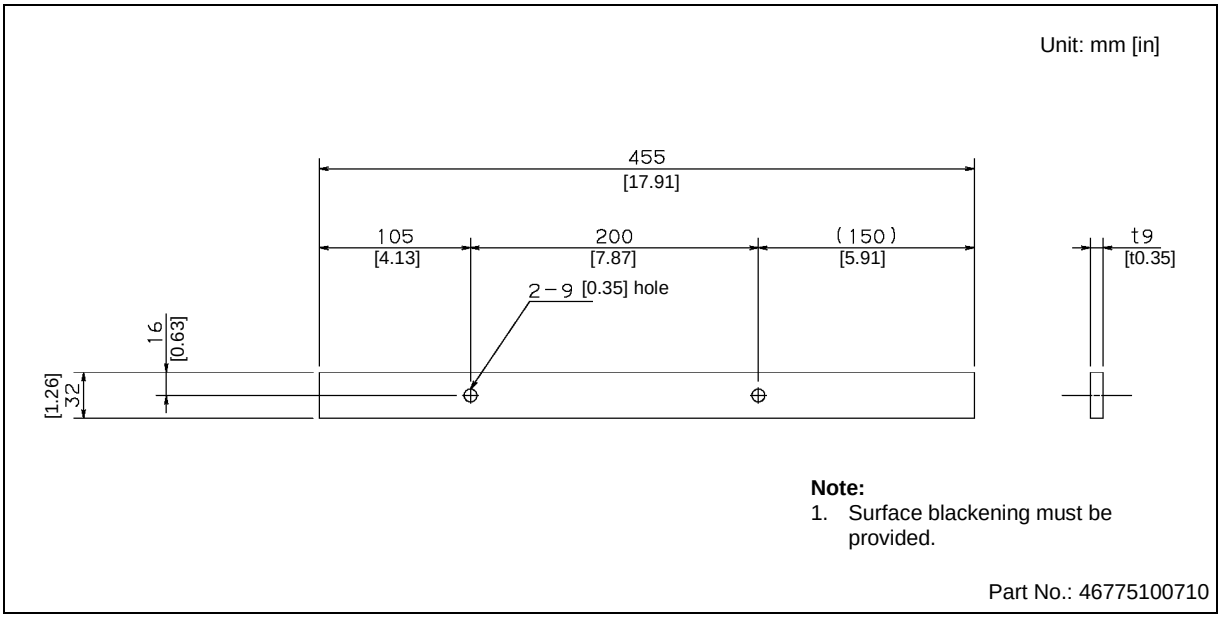

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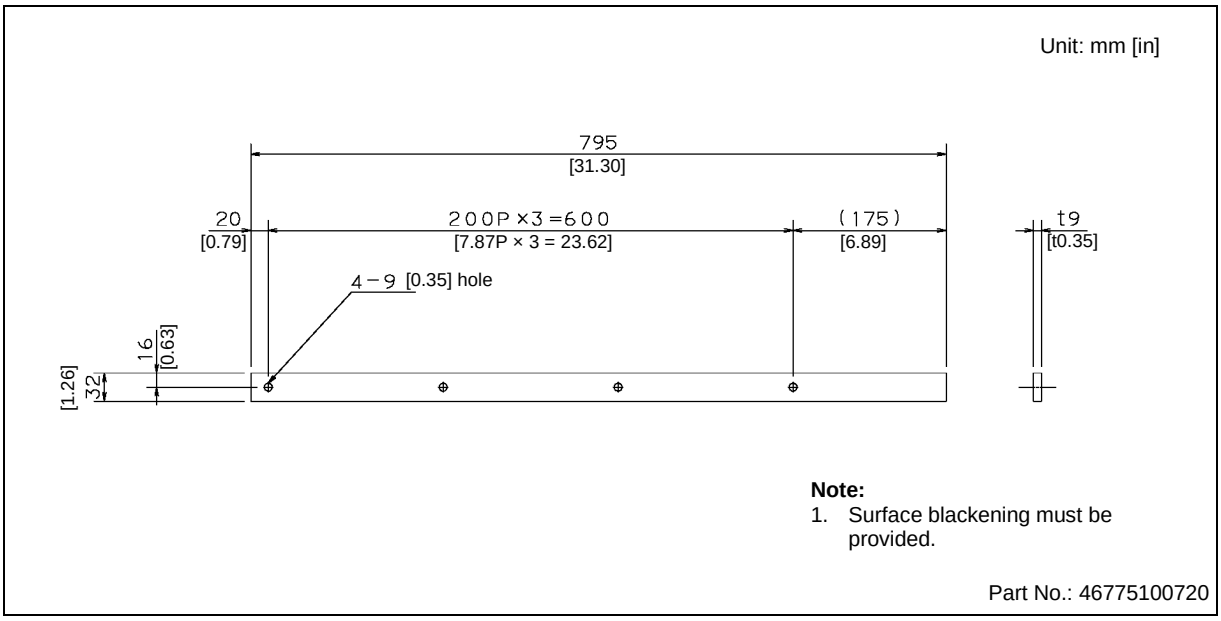


Fig. 4-24 Bar (No. 17)

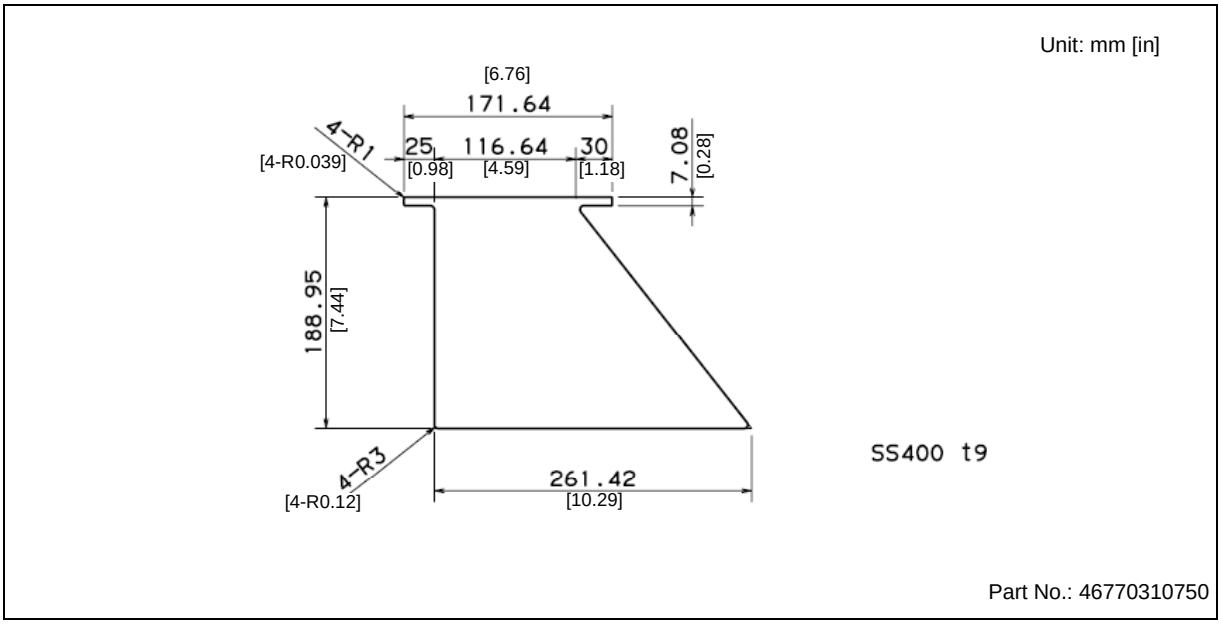
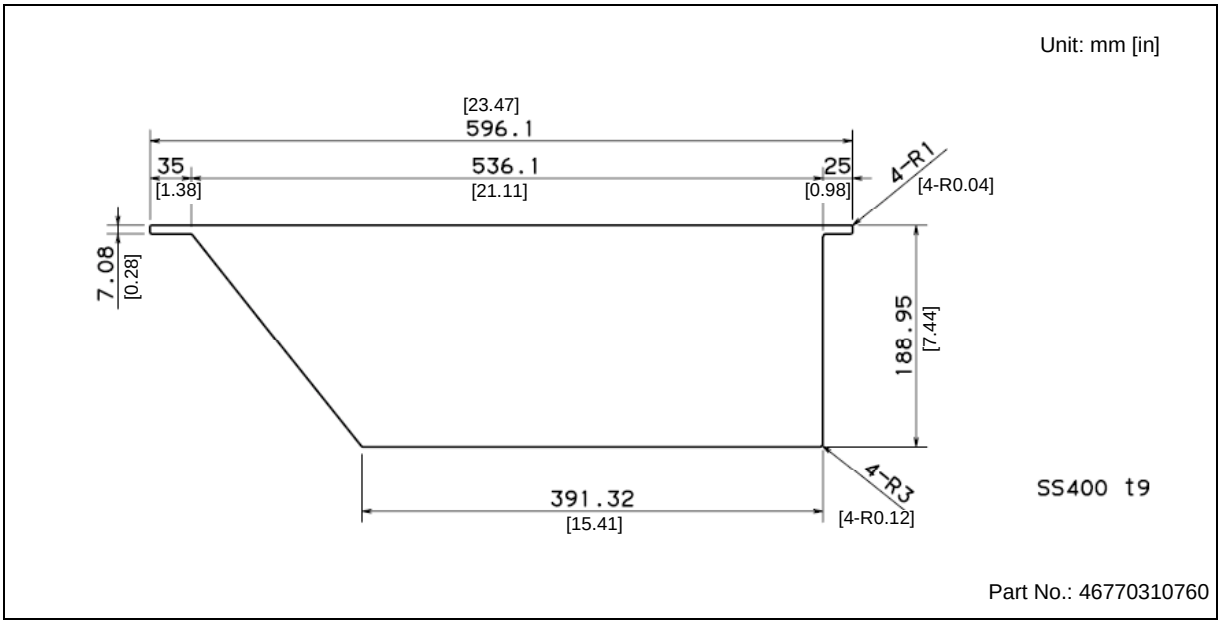


Fig. 4-25 Plate (No. 18)



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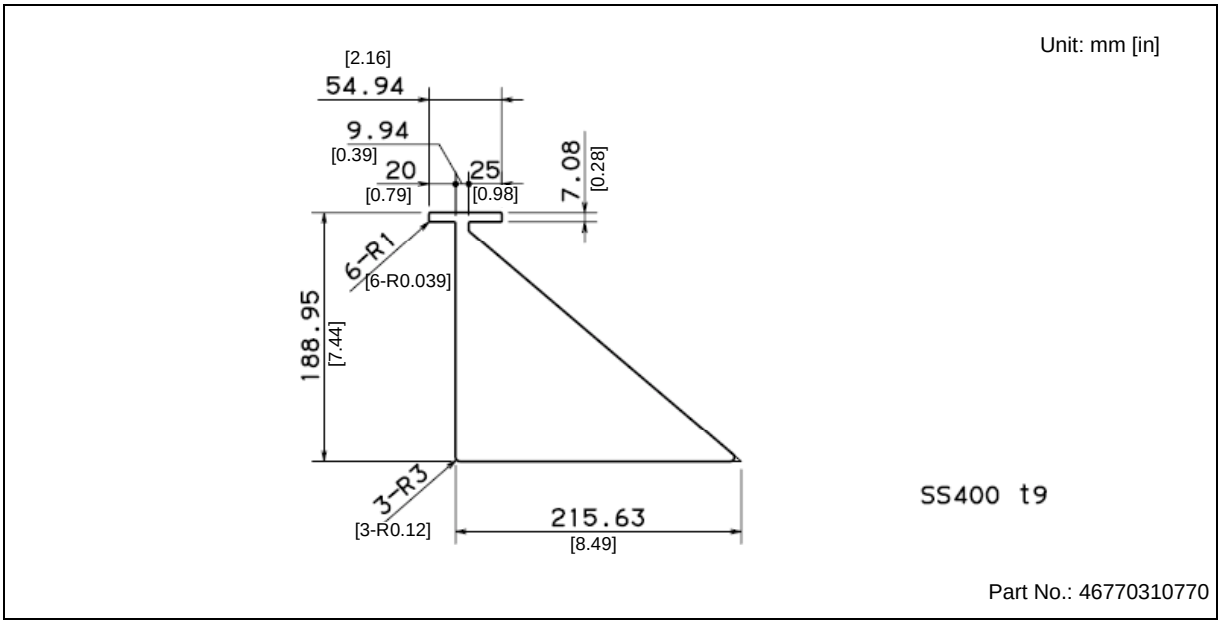

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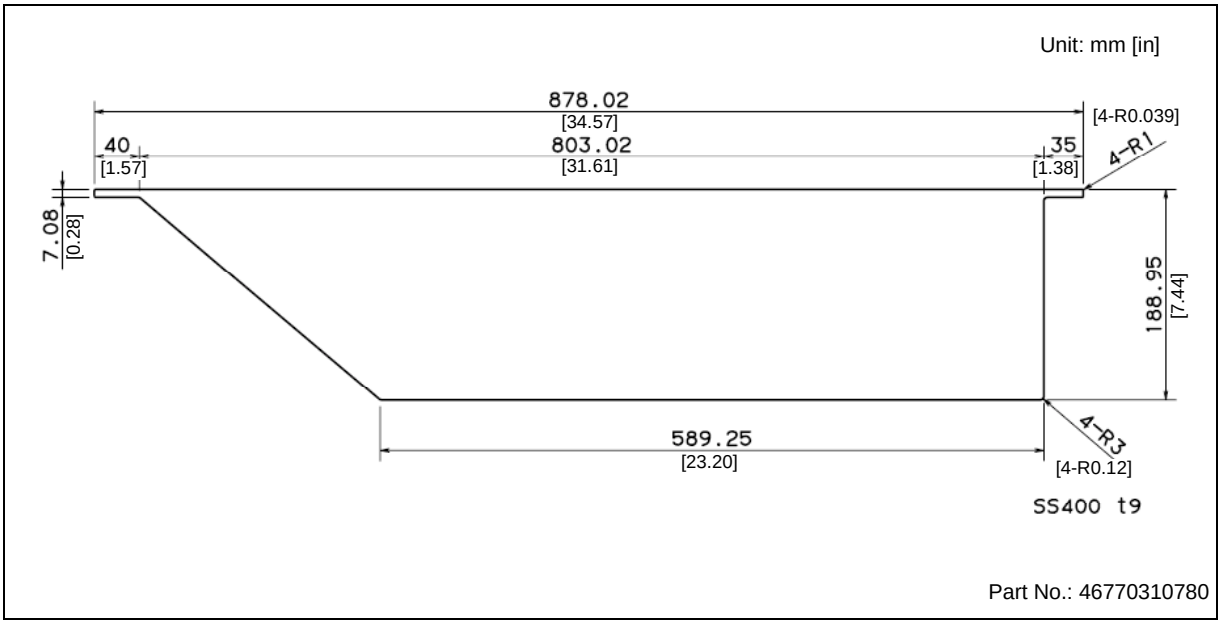

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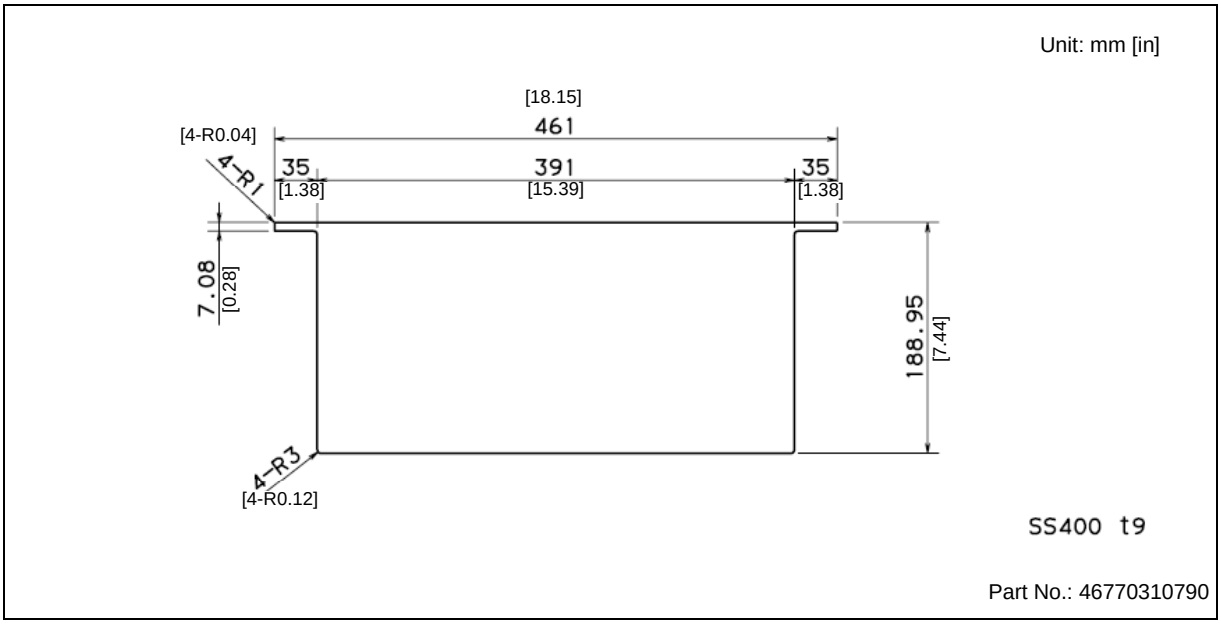

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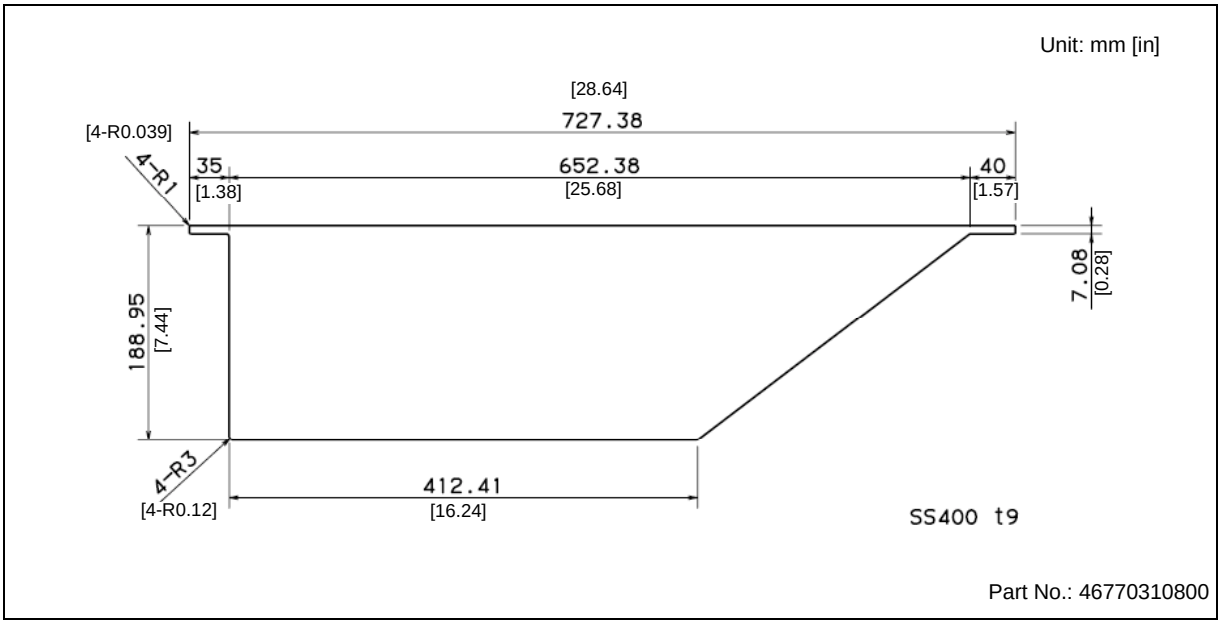

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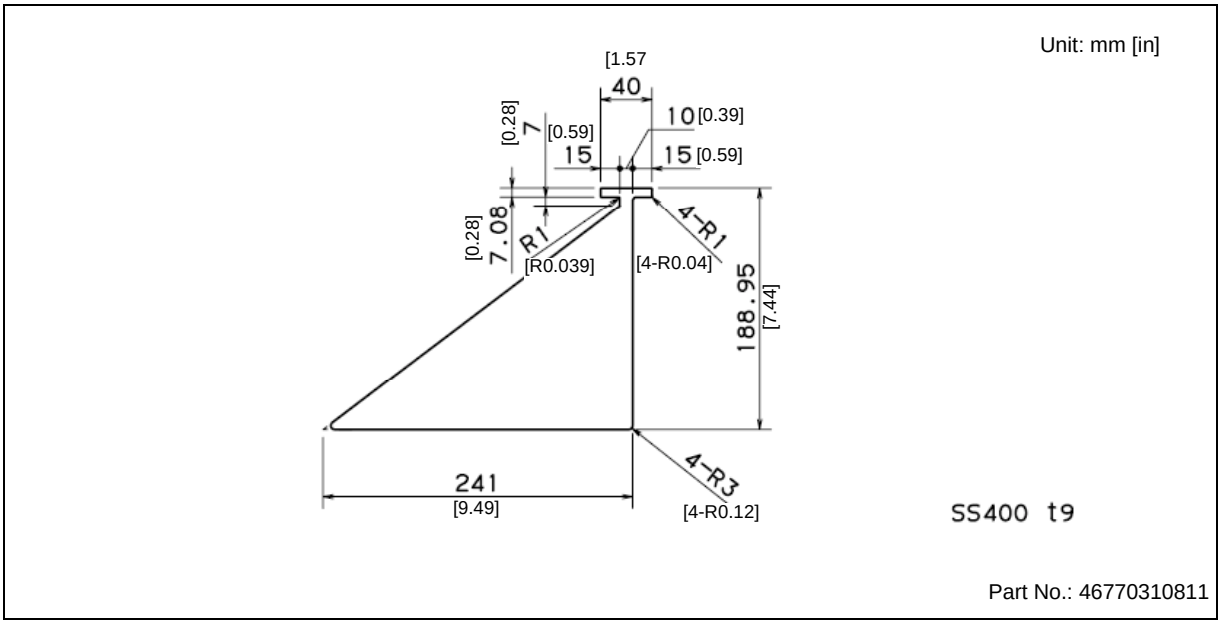

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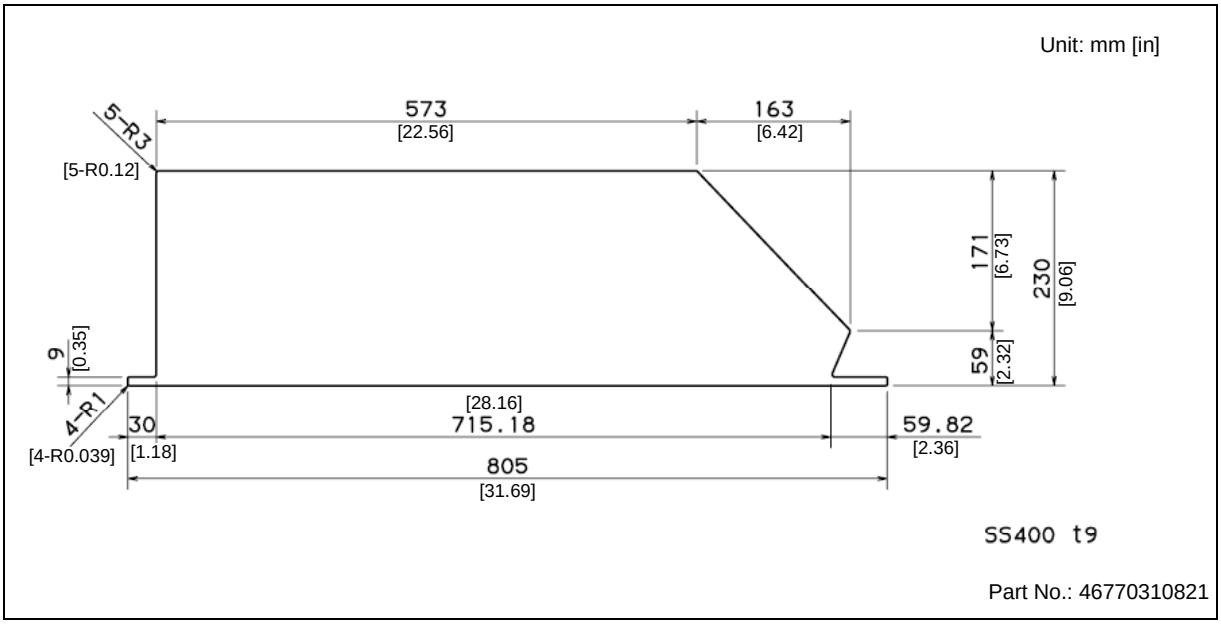

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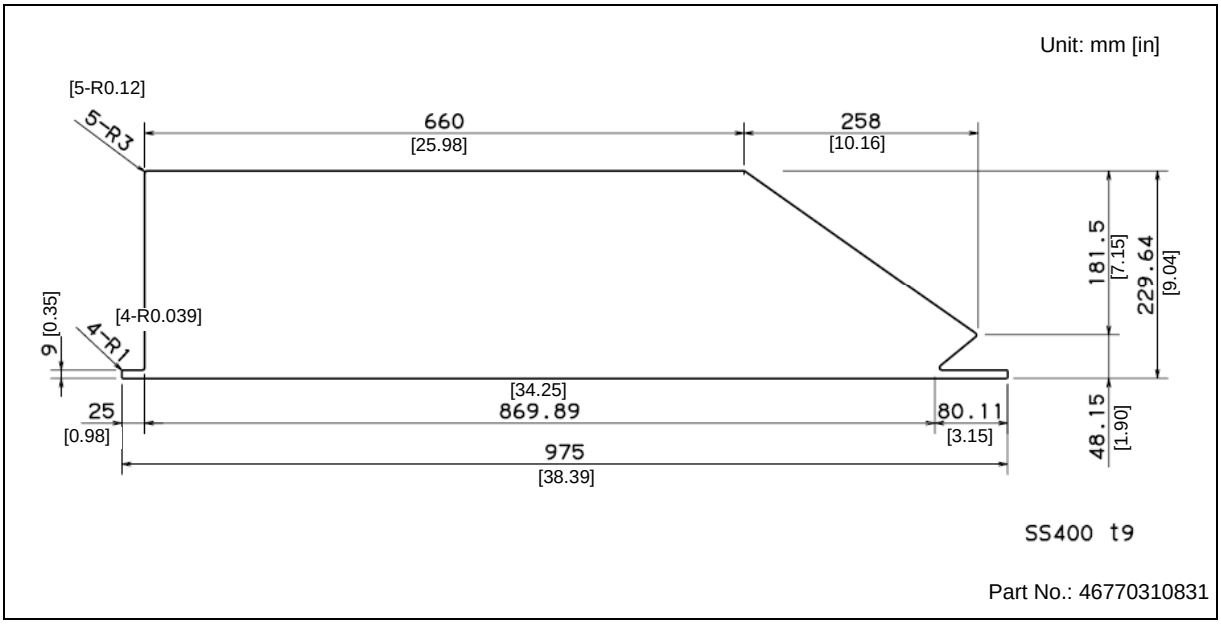

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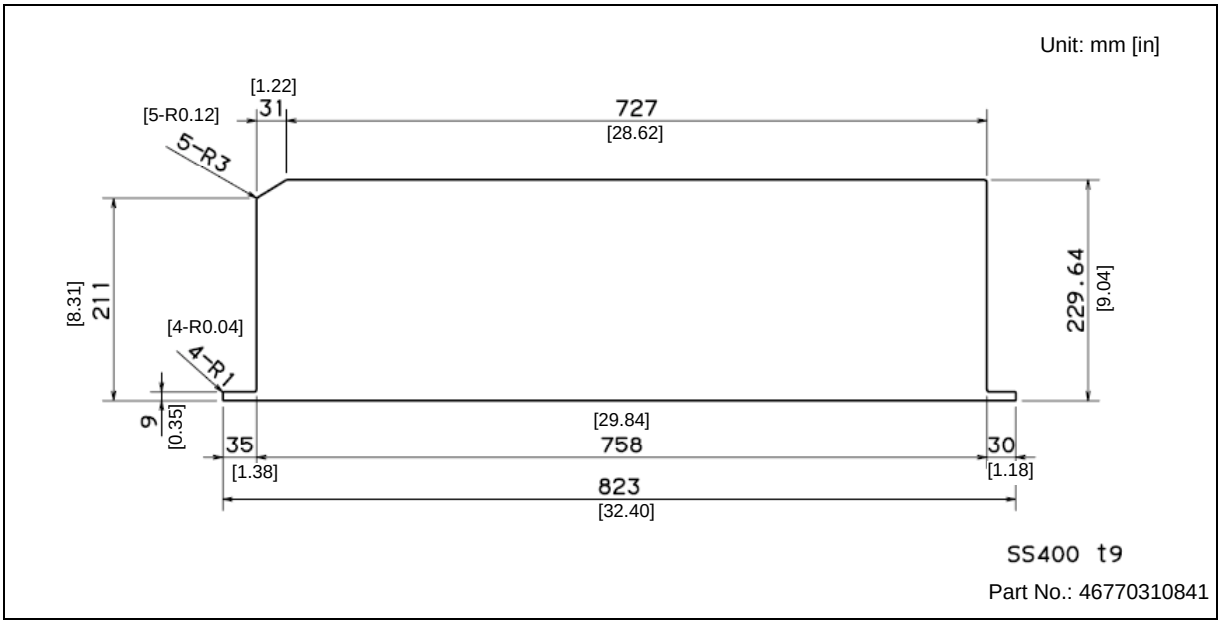

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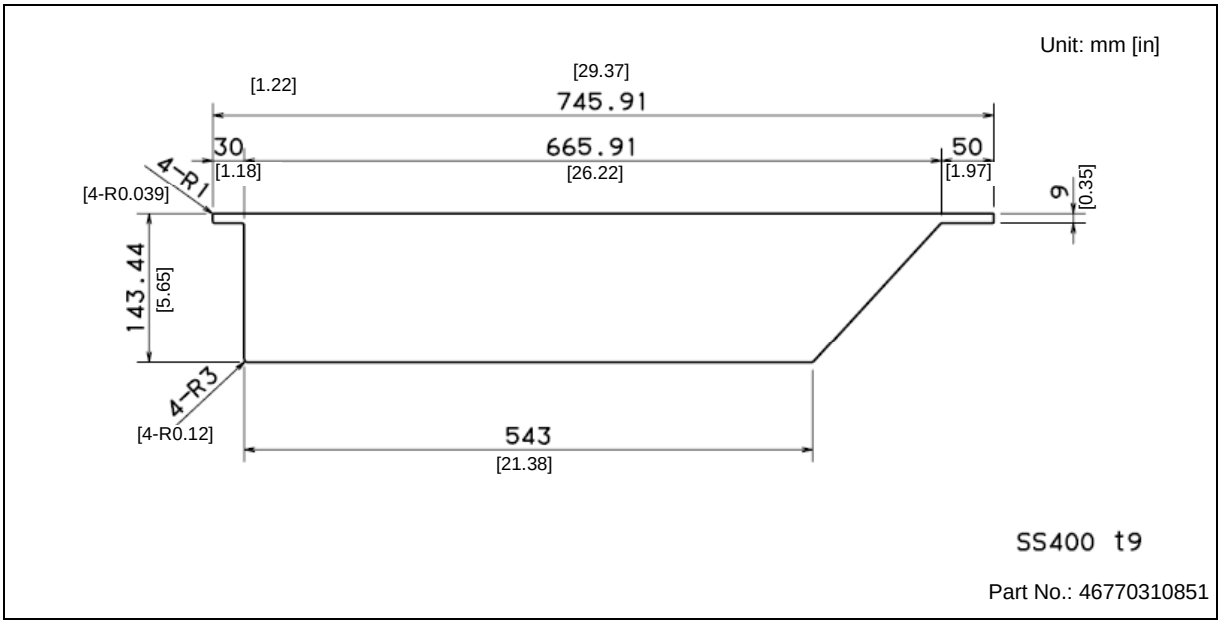

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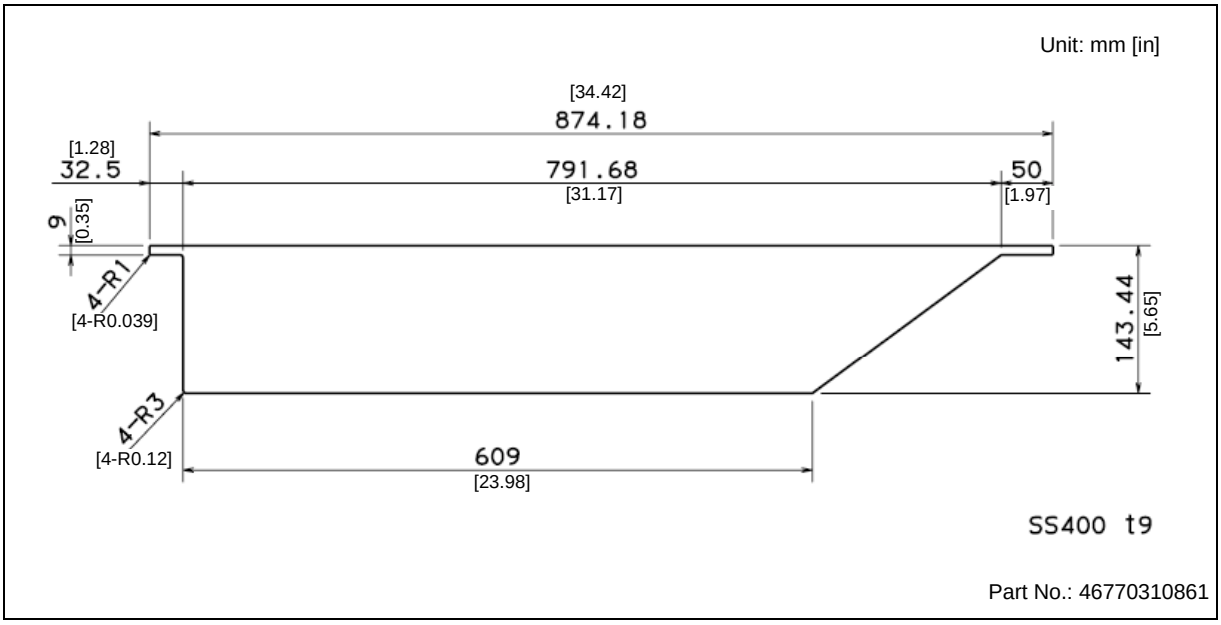

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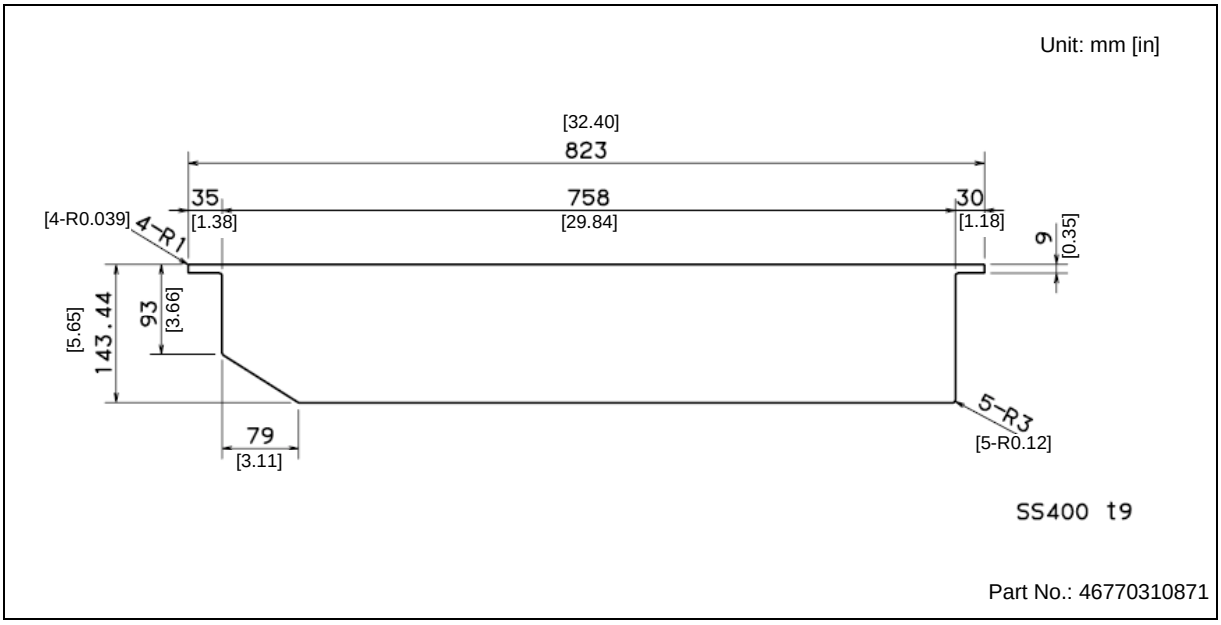

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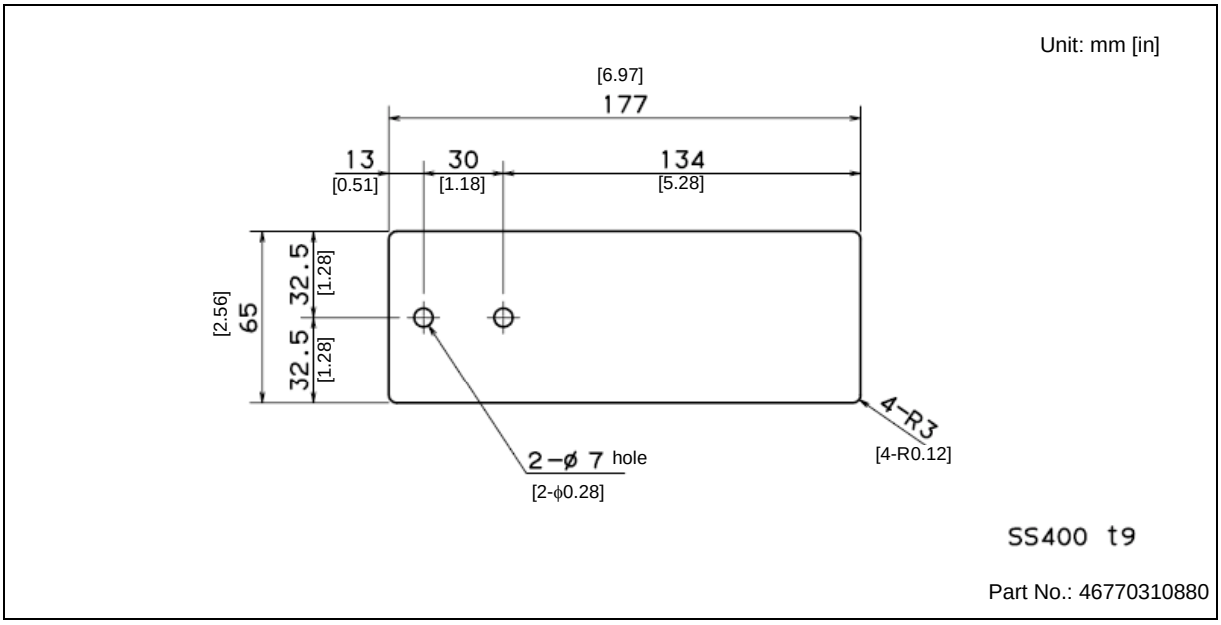

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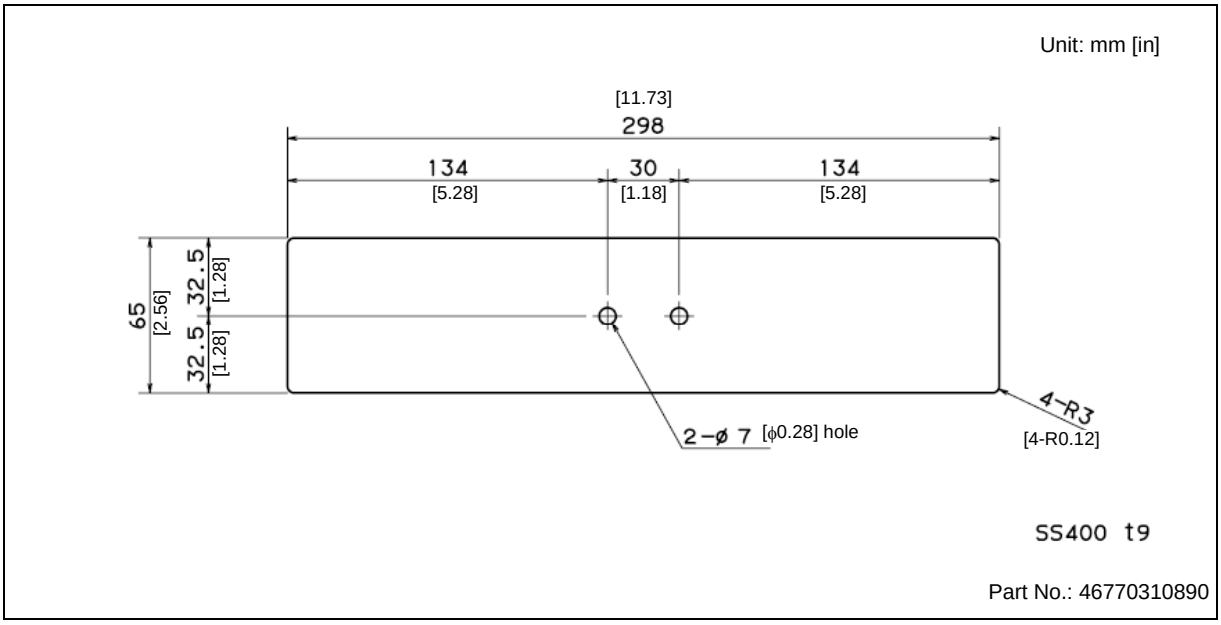

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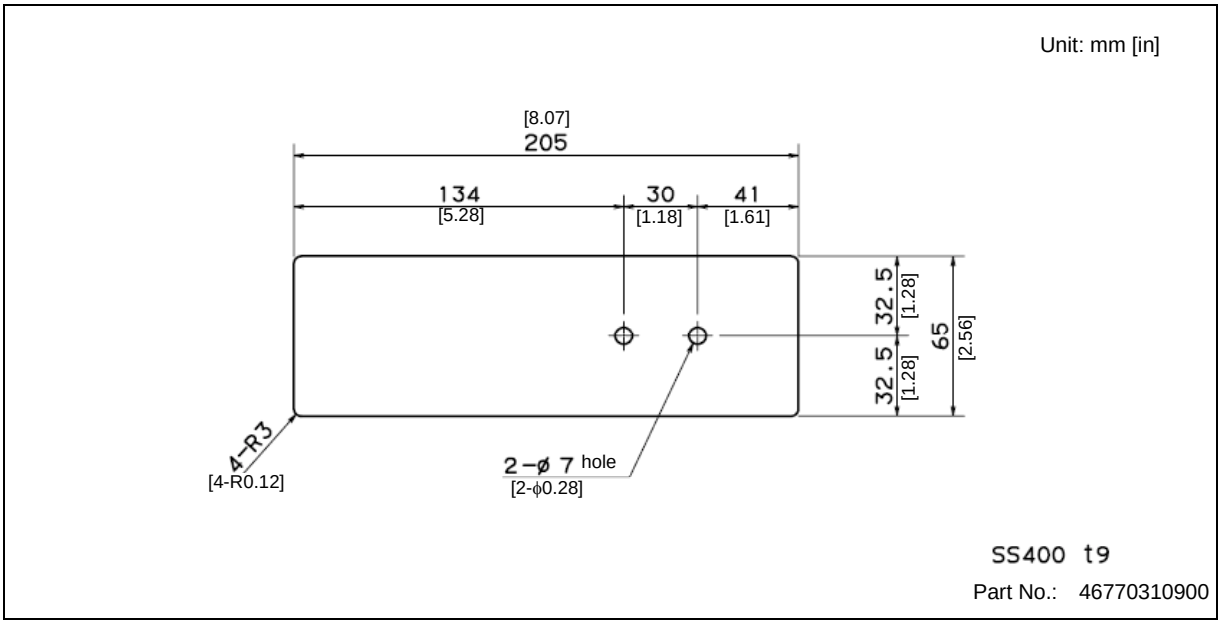

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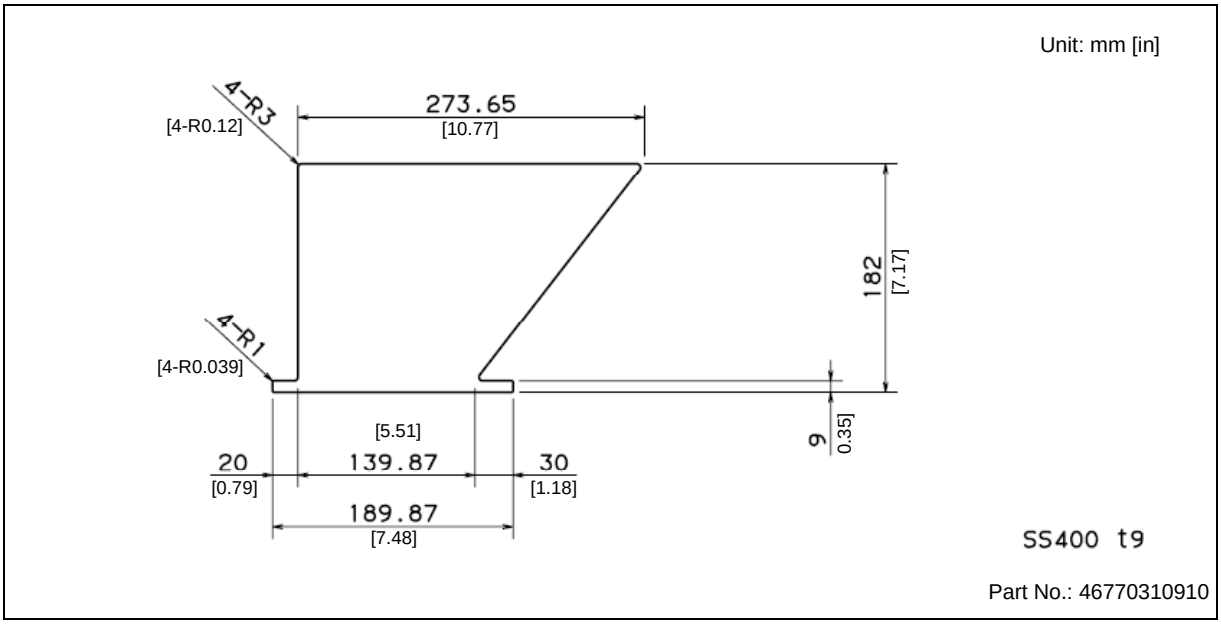

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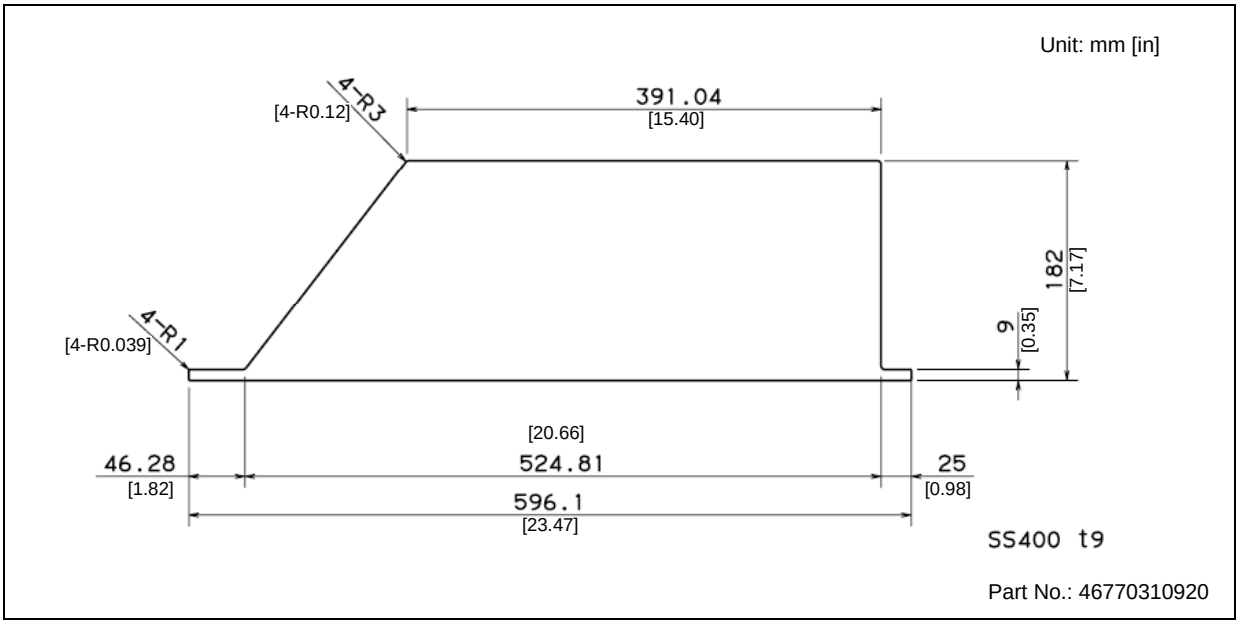

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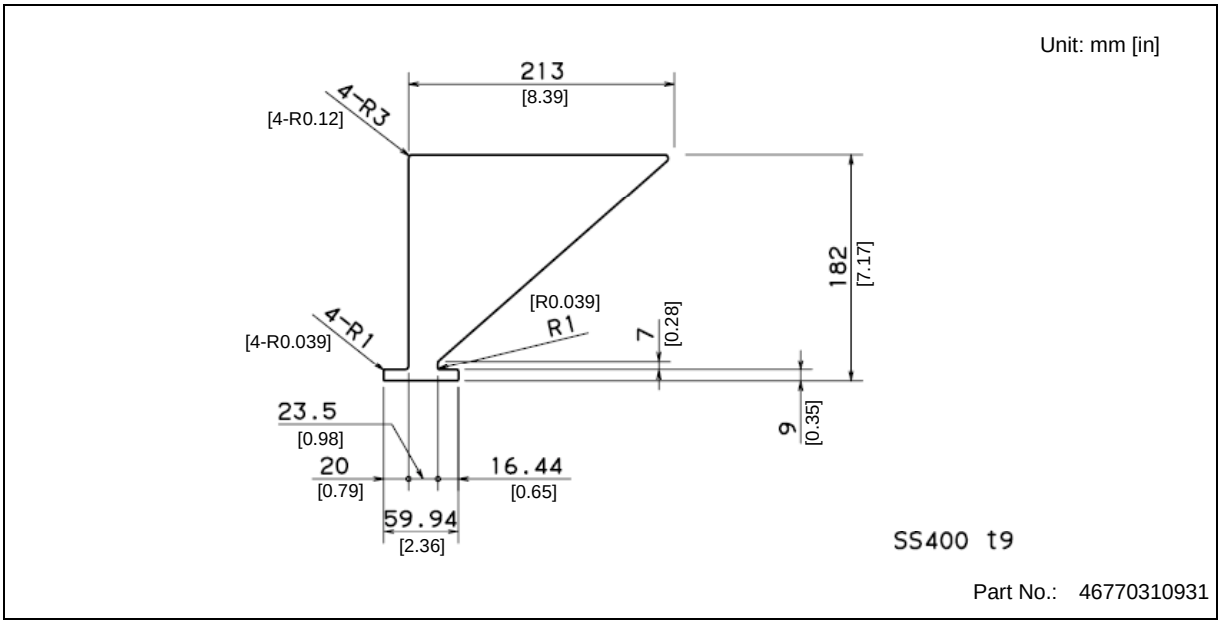

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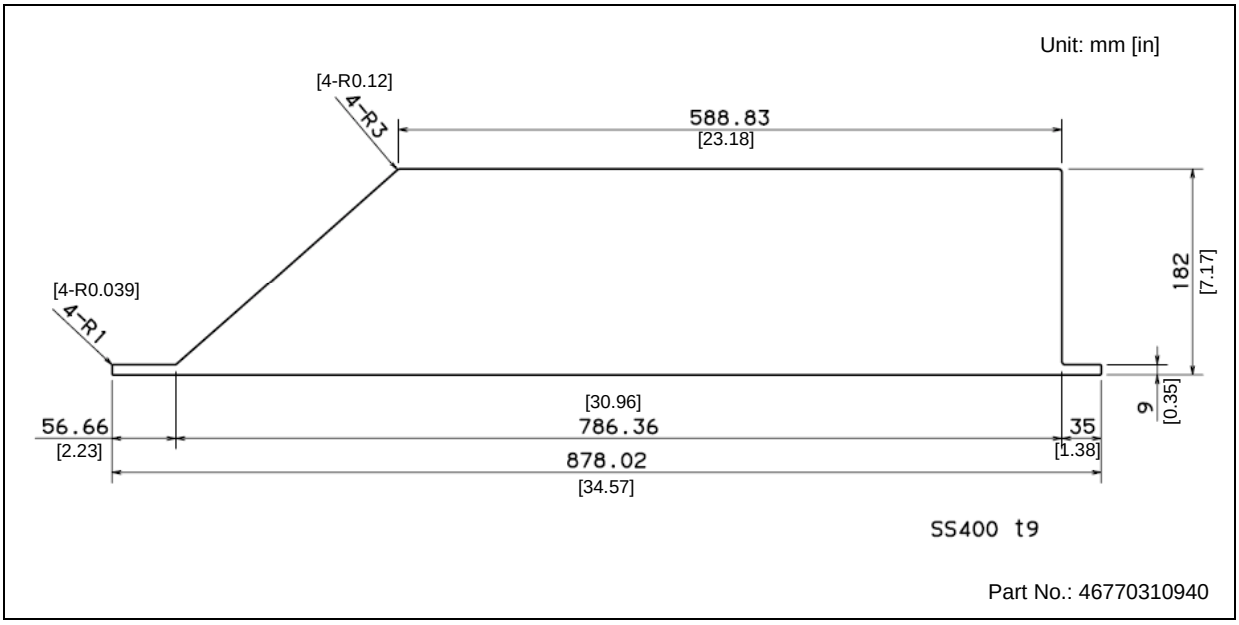

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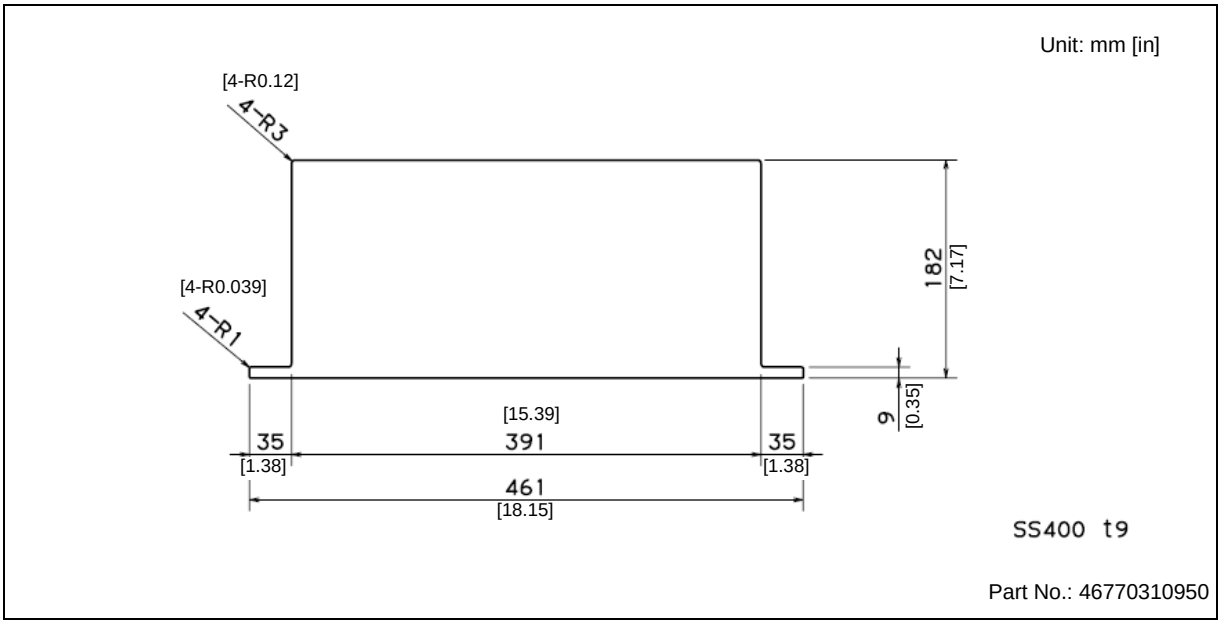

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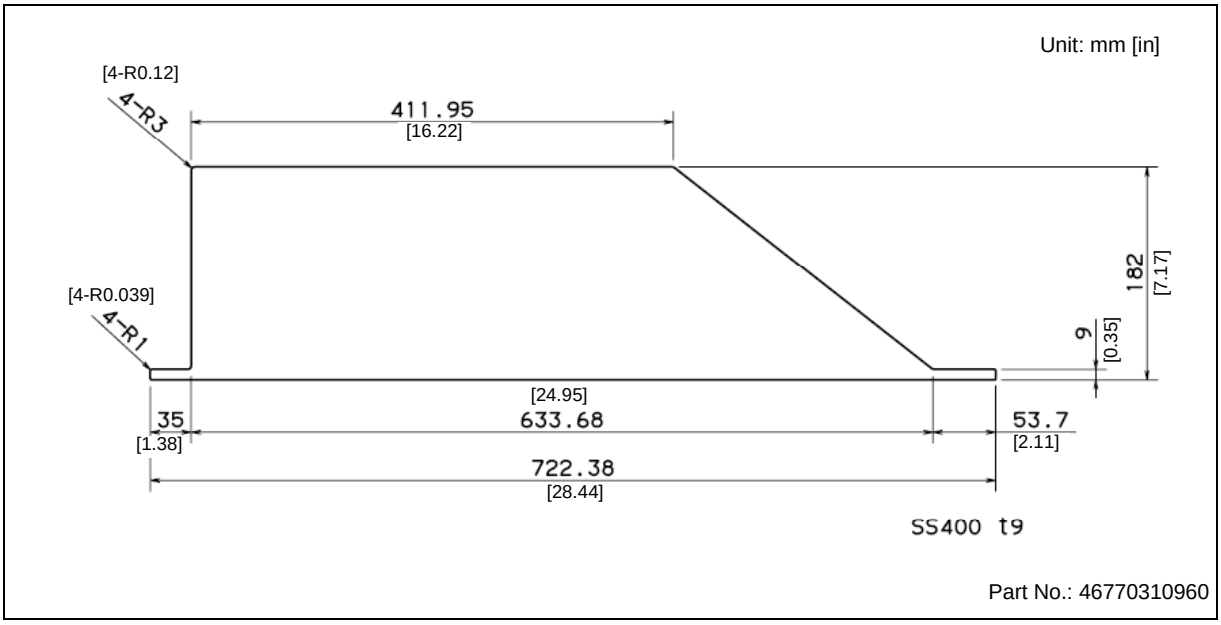

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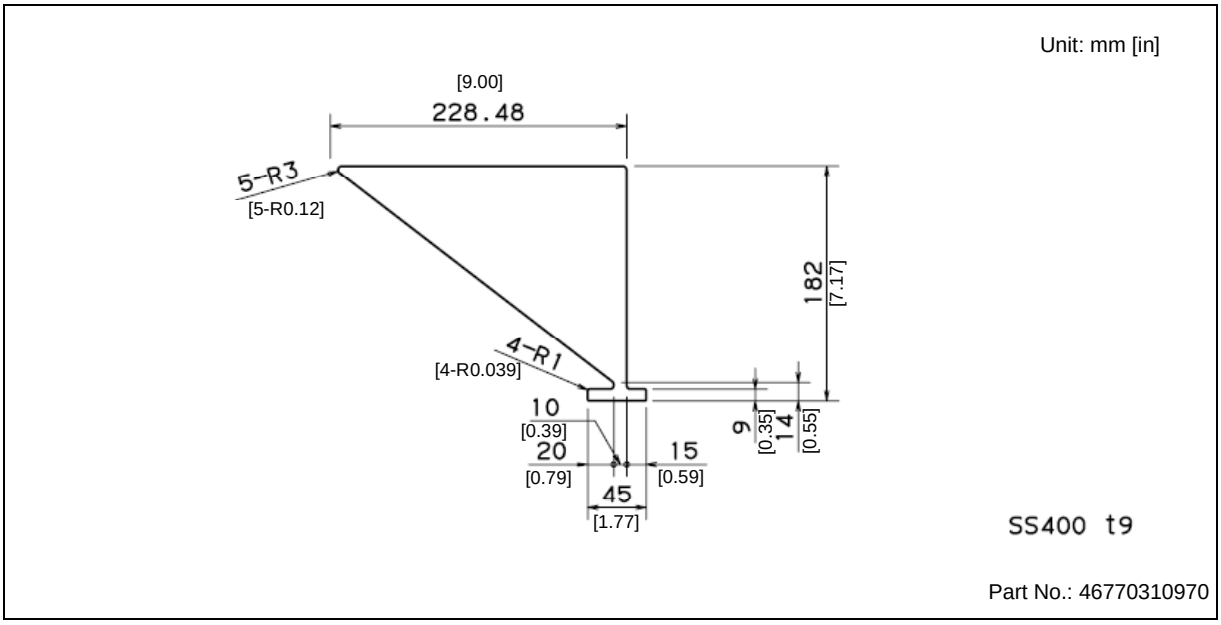

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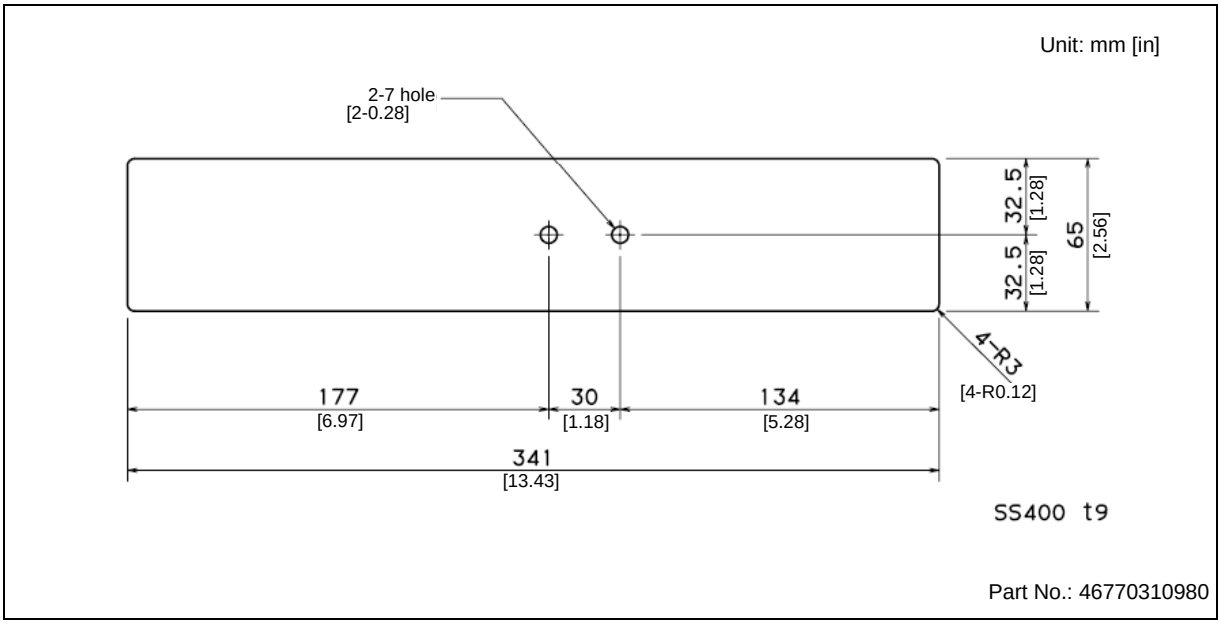

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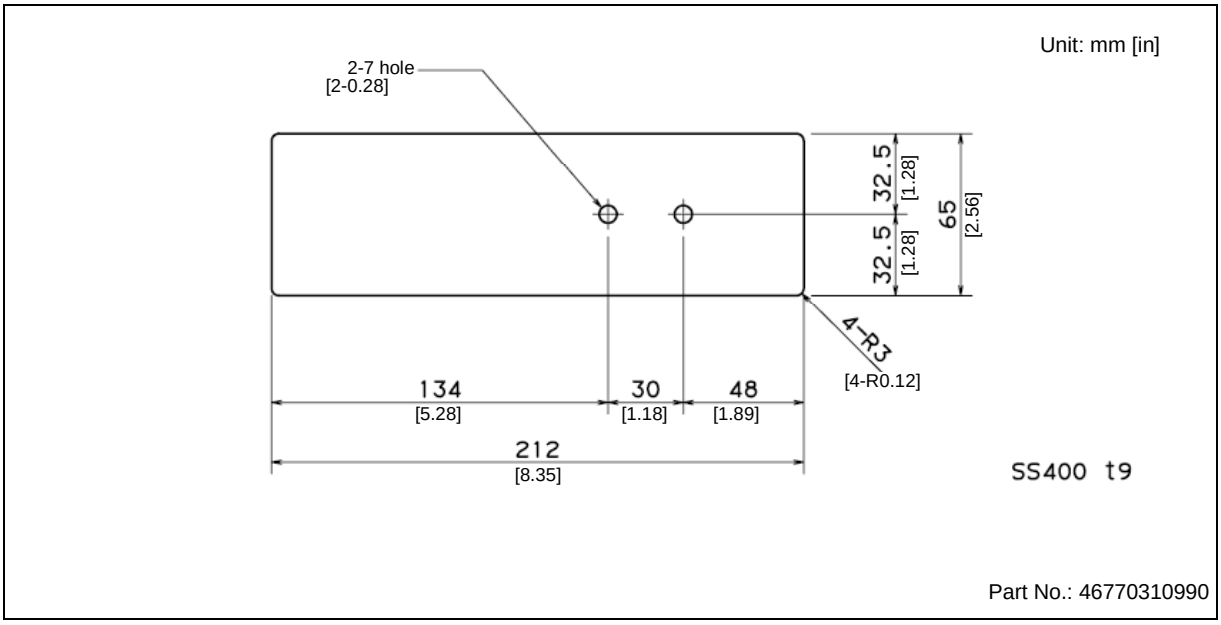

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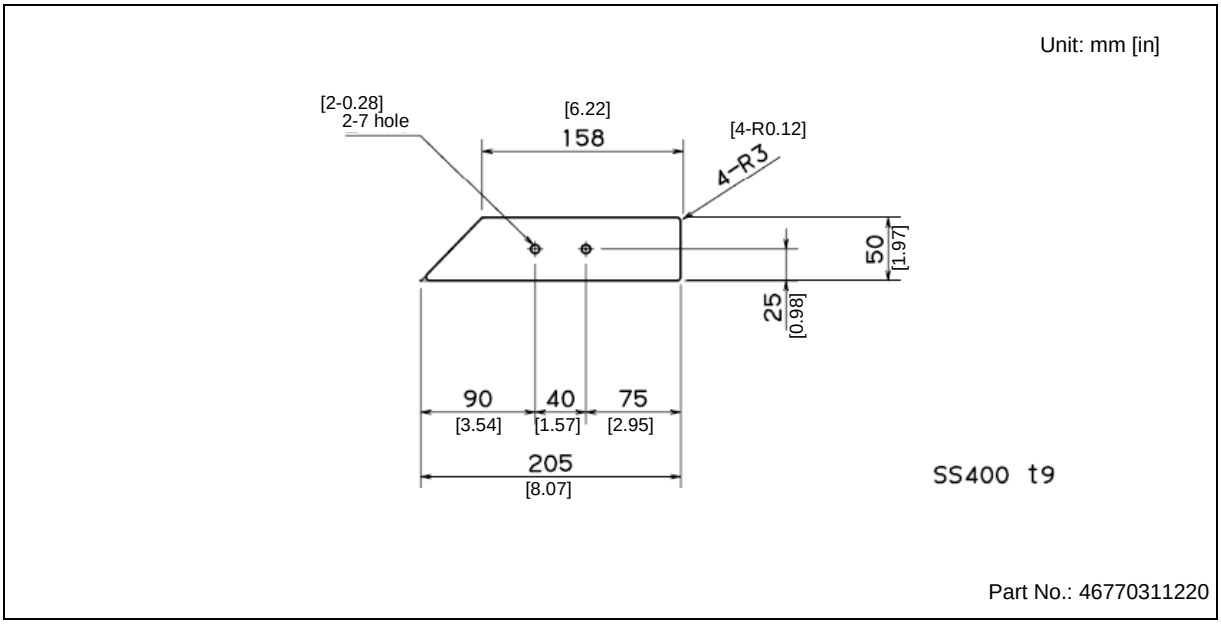
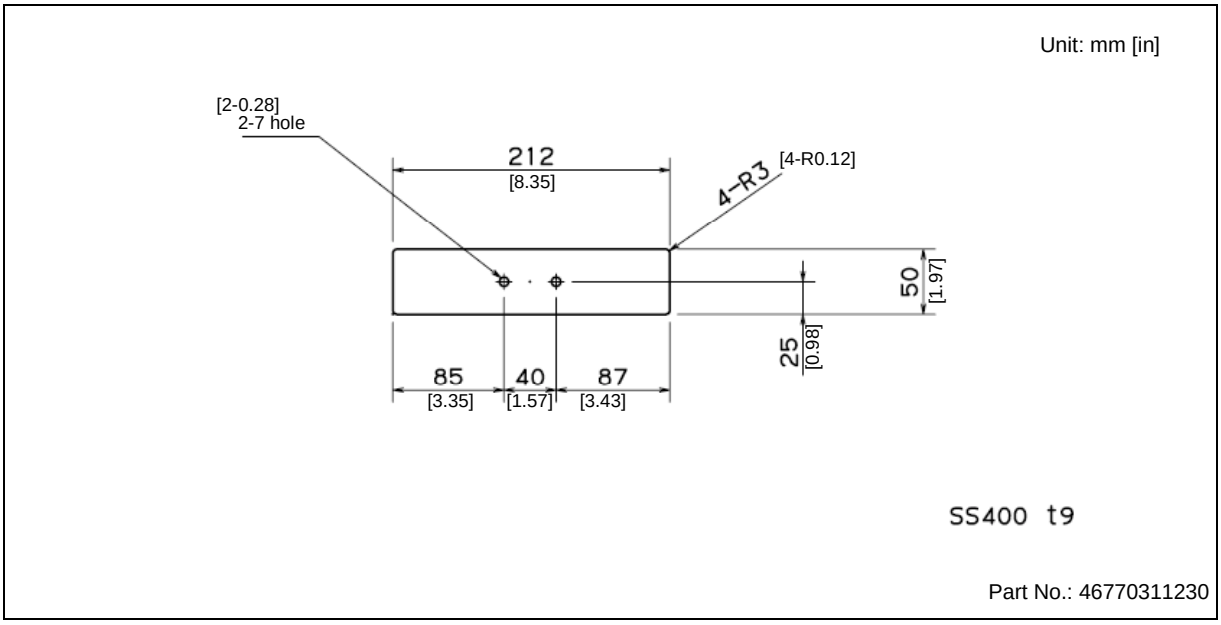


Fig. 4-50 Plate (No. 43)



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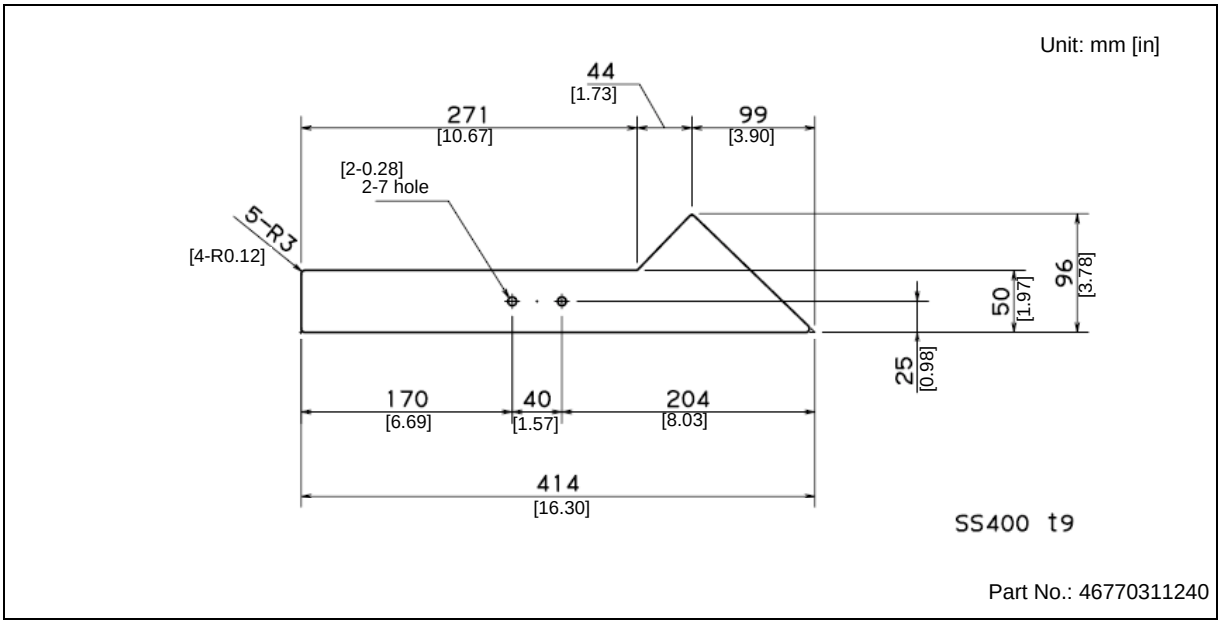

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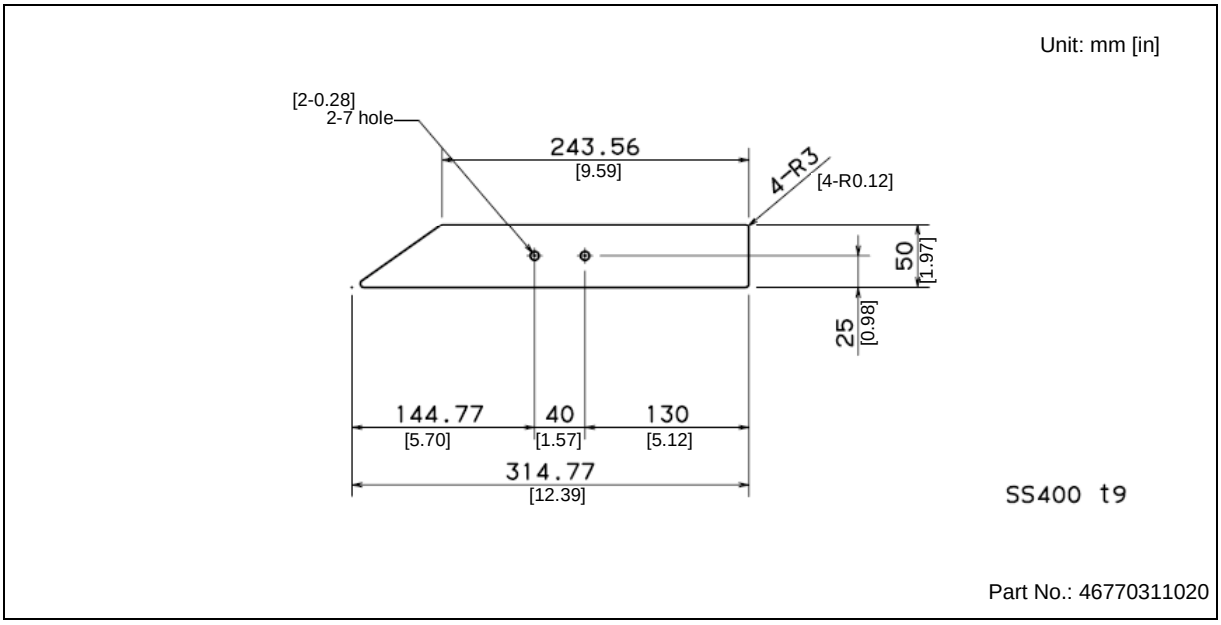

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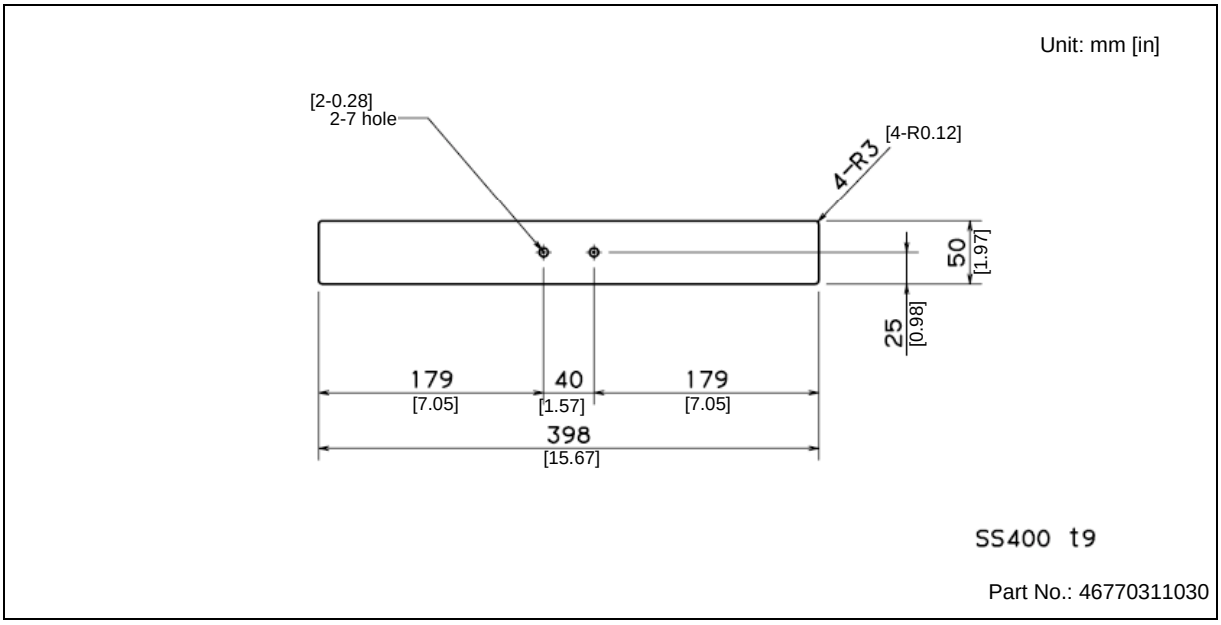

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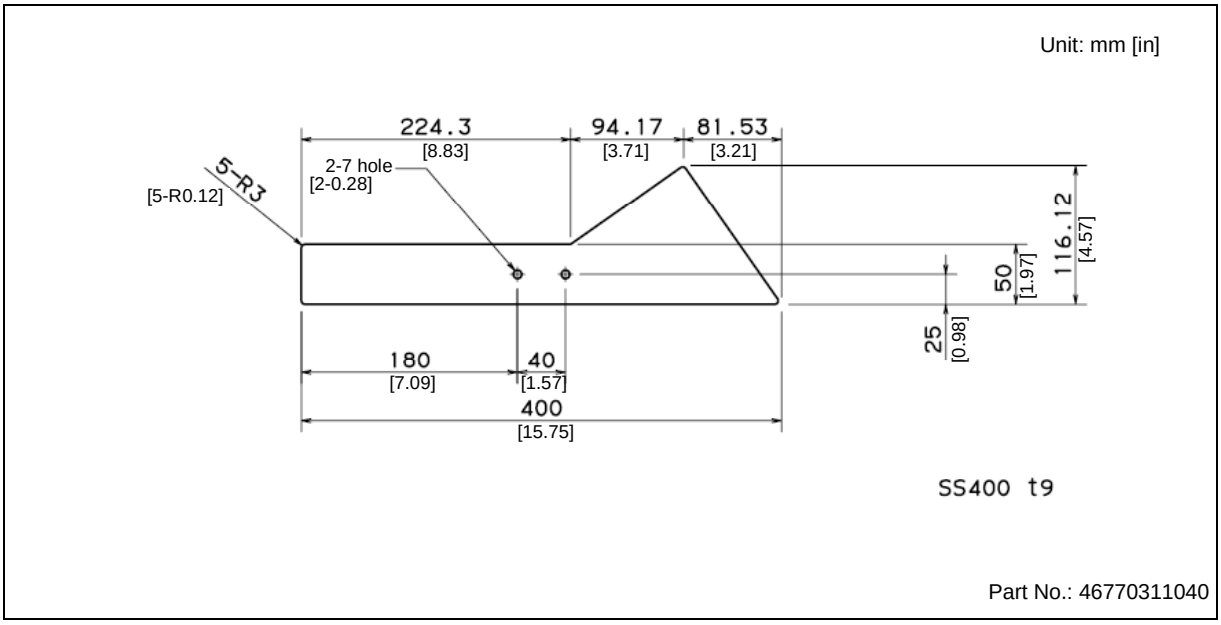
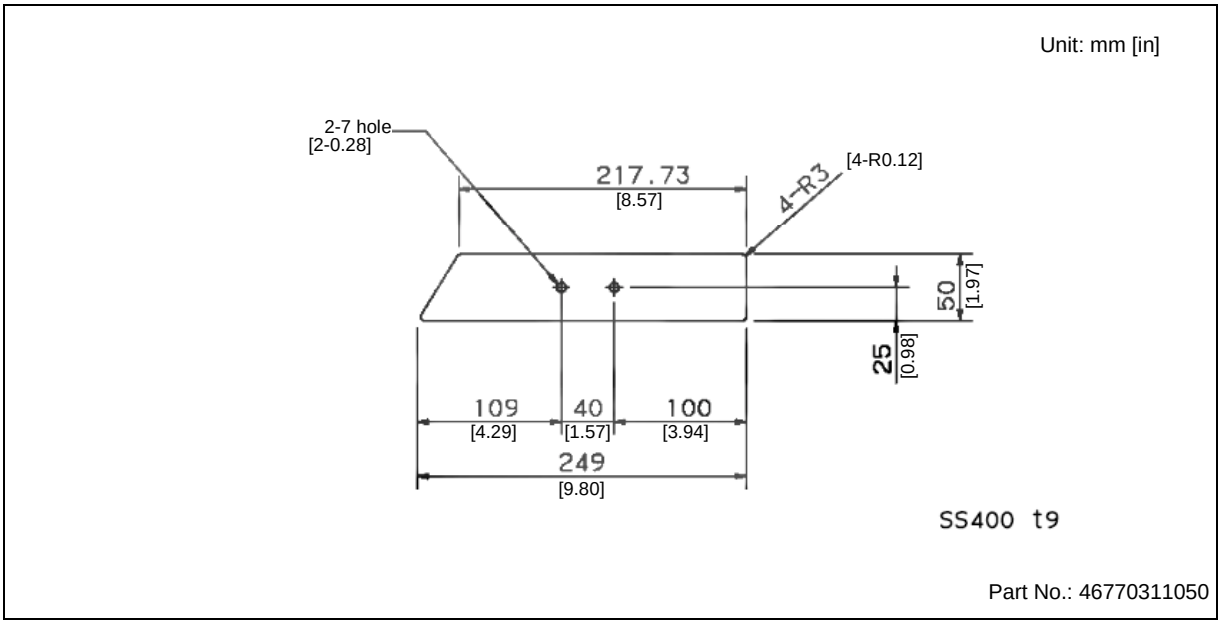


Fig. 4-55 Plate (No. 48)



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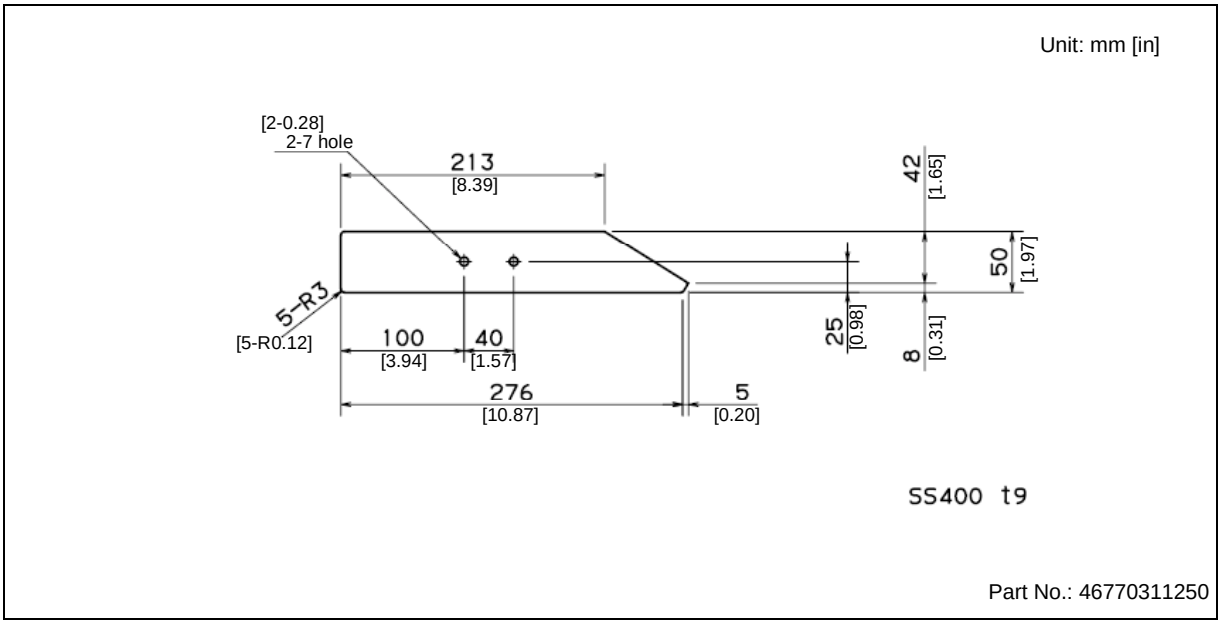

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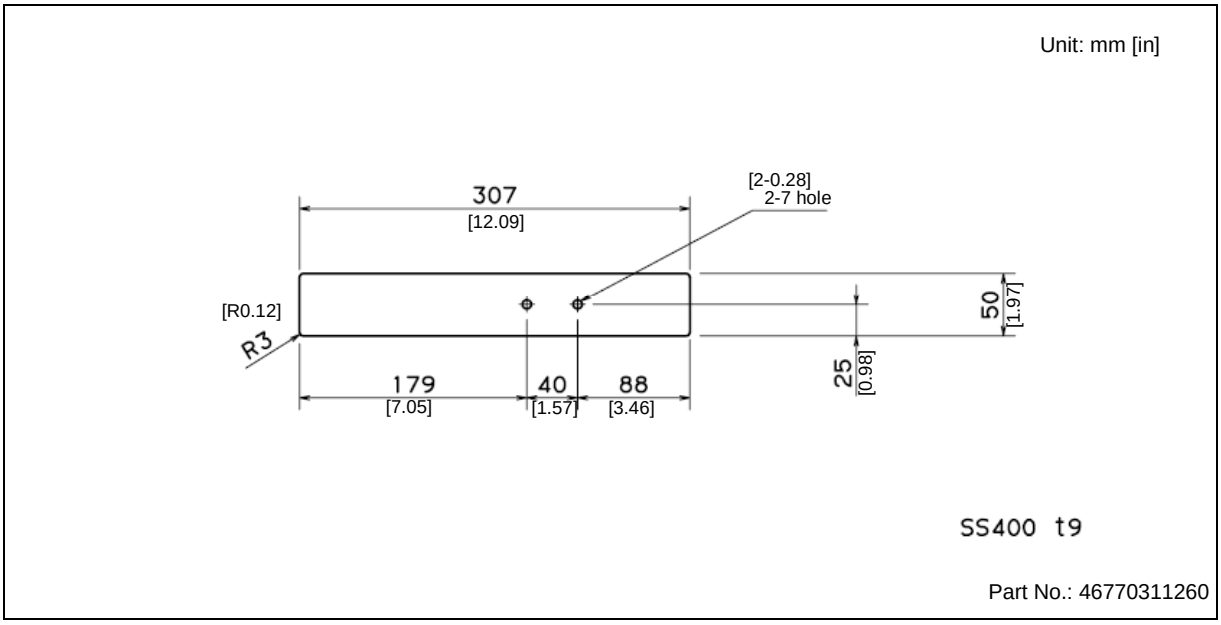
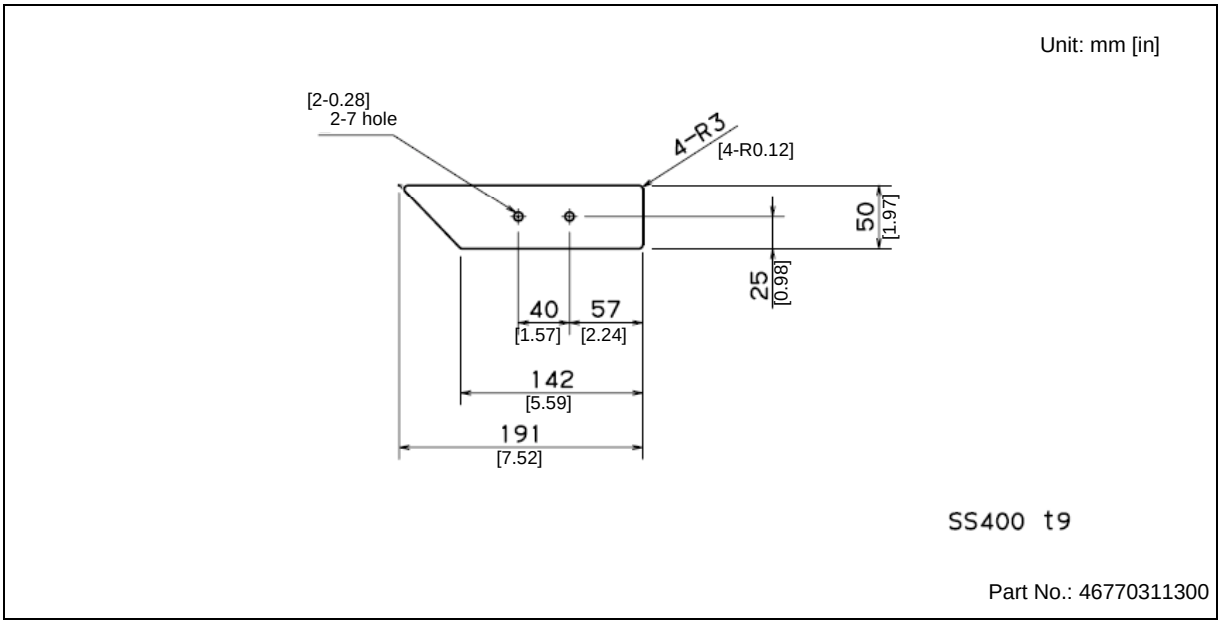


Fig. 4-58 Plate (No. 51)



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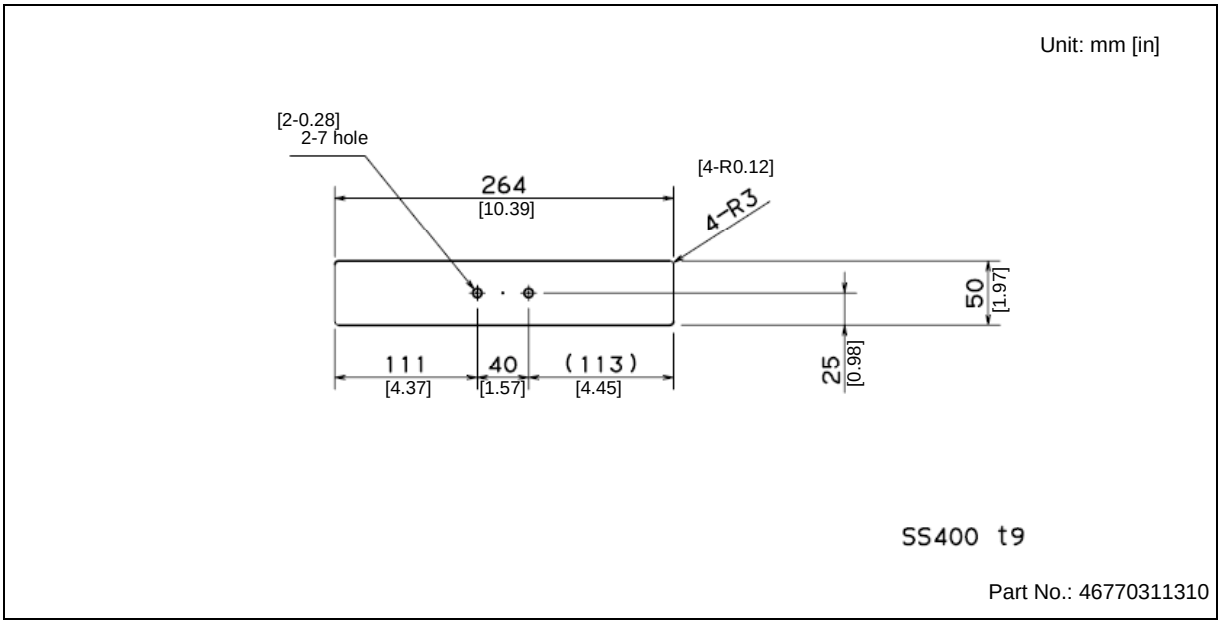

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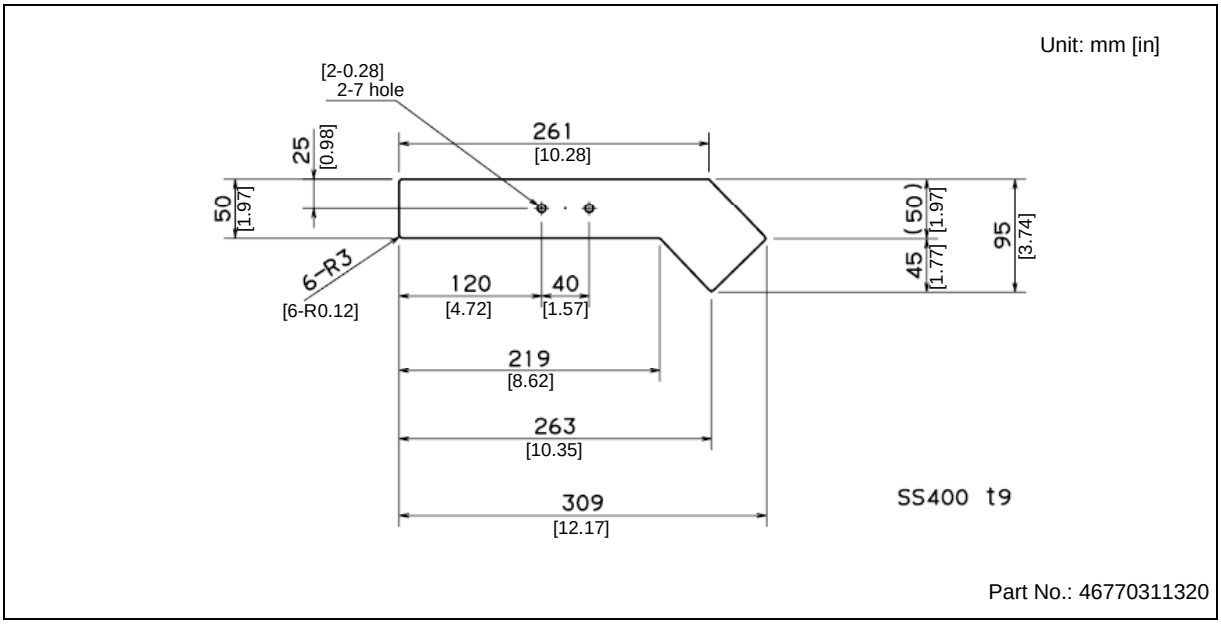

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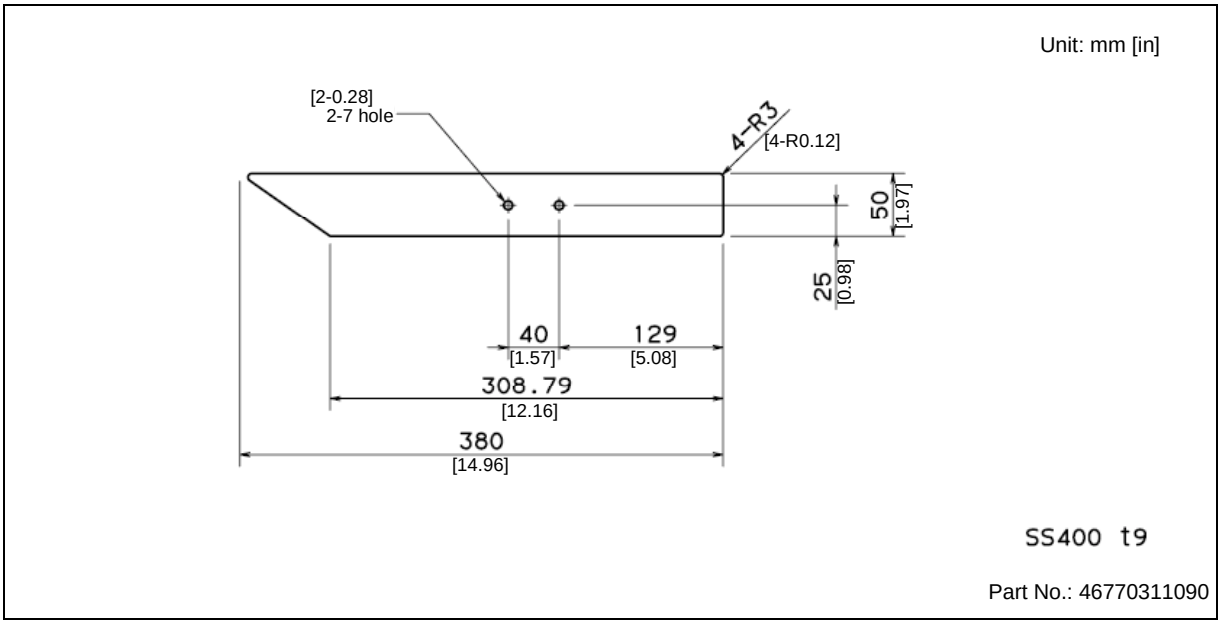
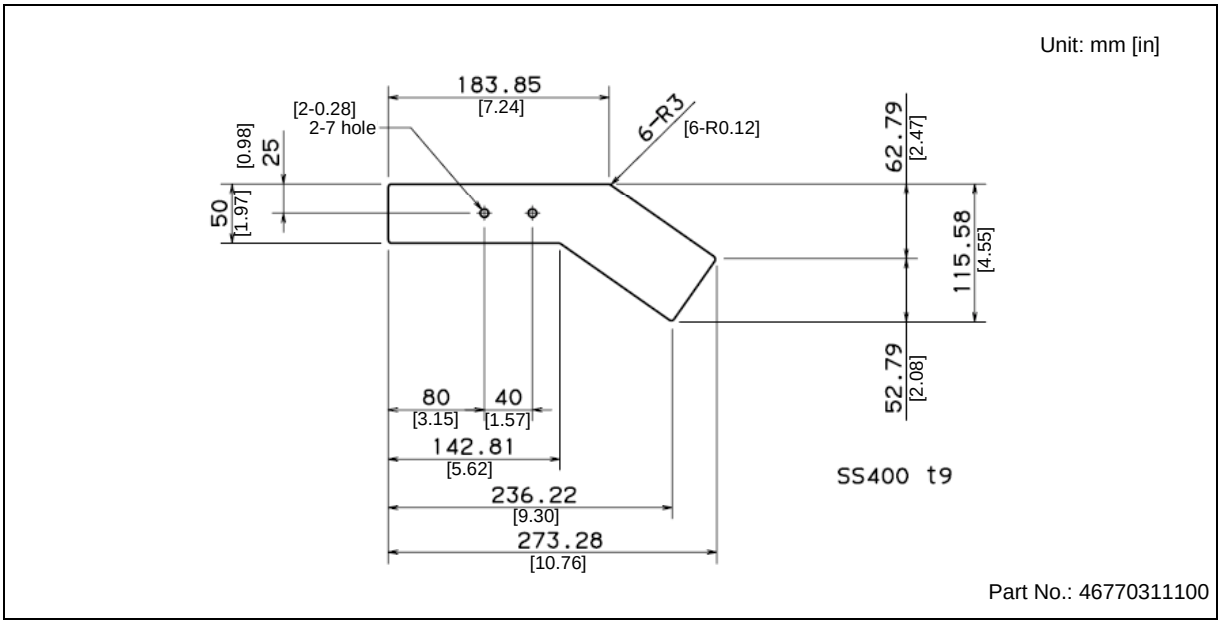


Fig. 4-62 Plate (No. 55)



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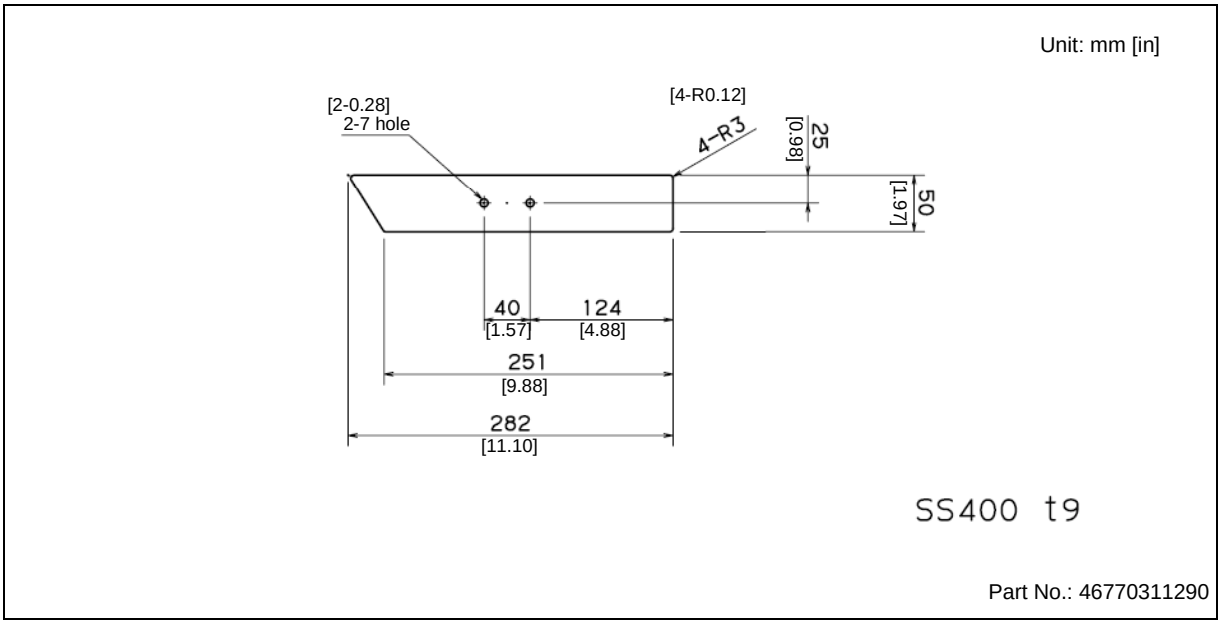

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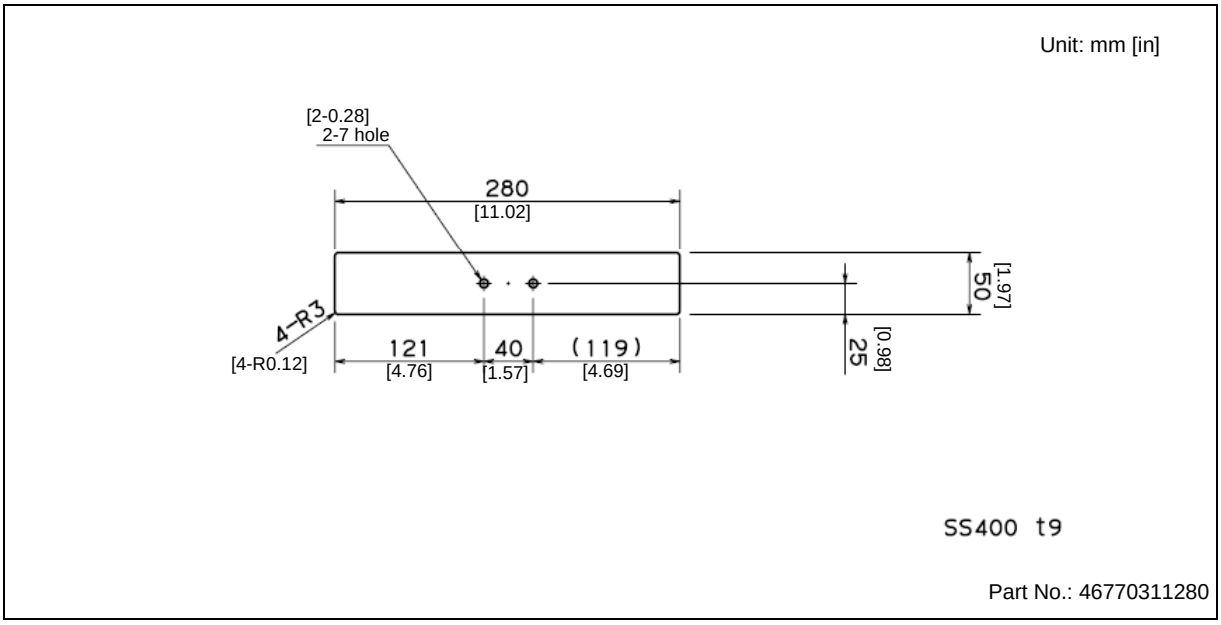

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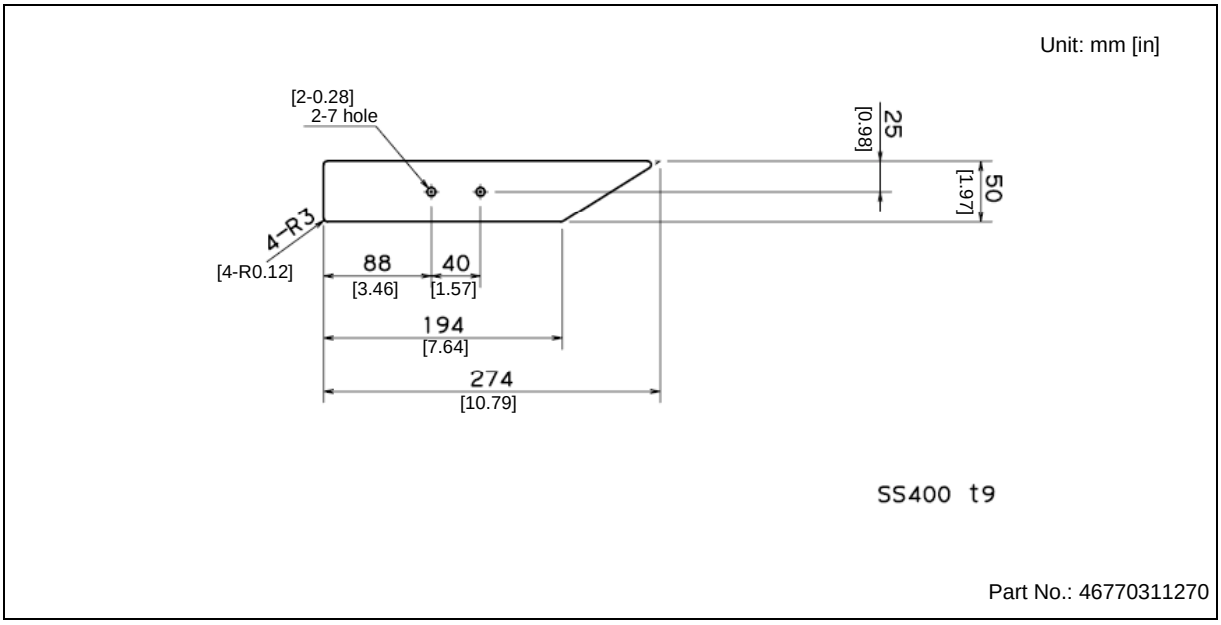

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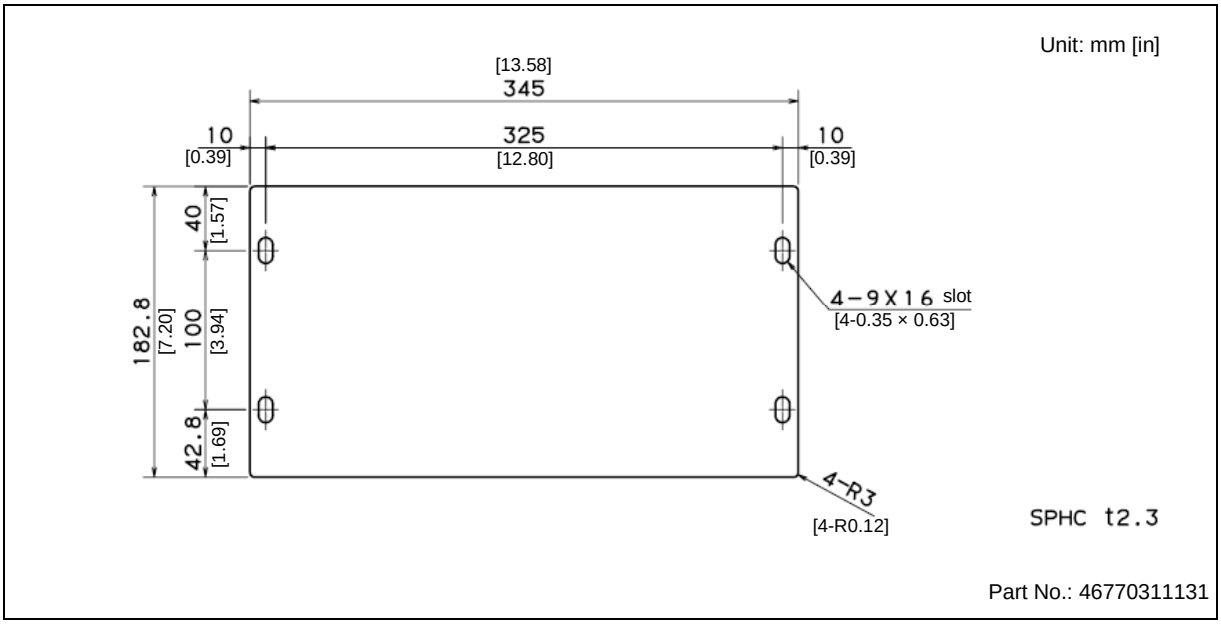

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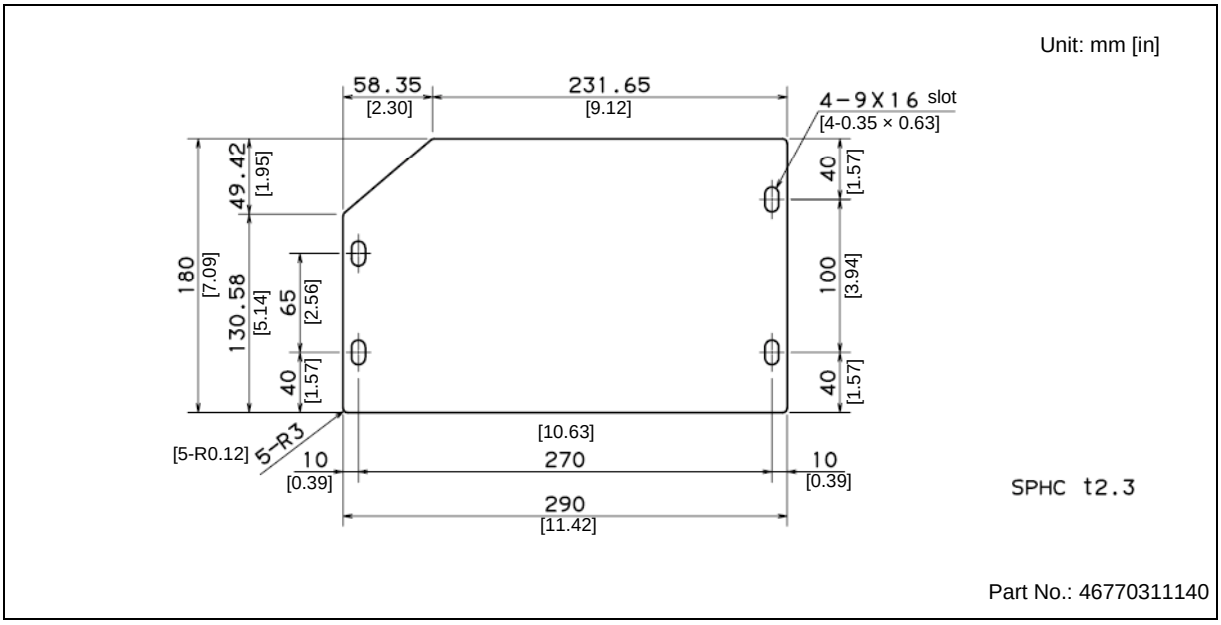

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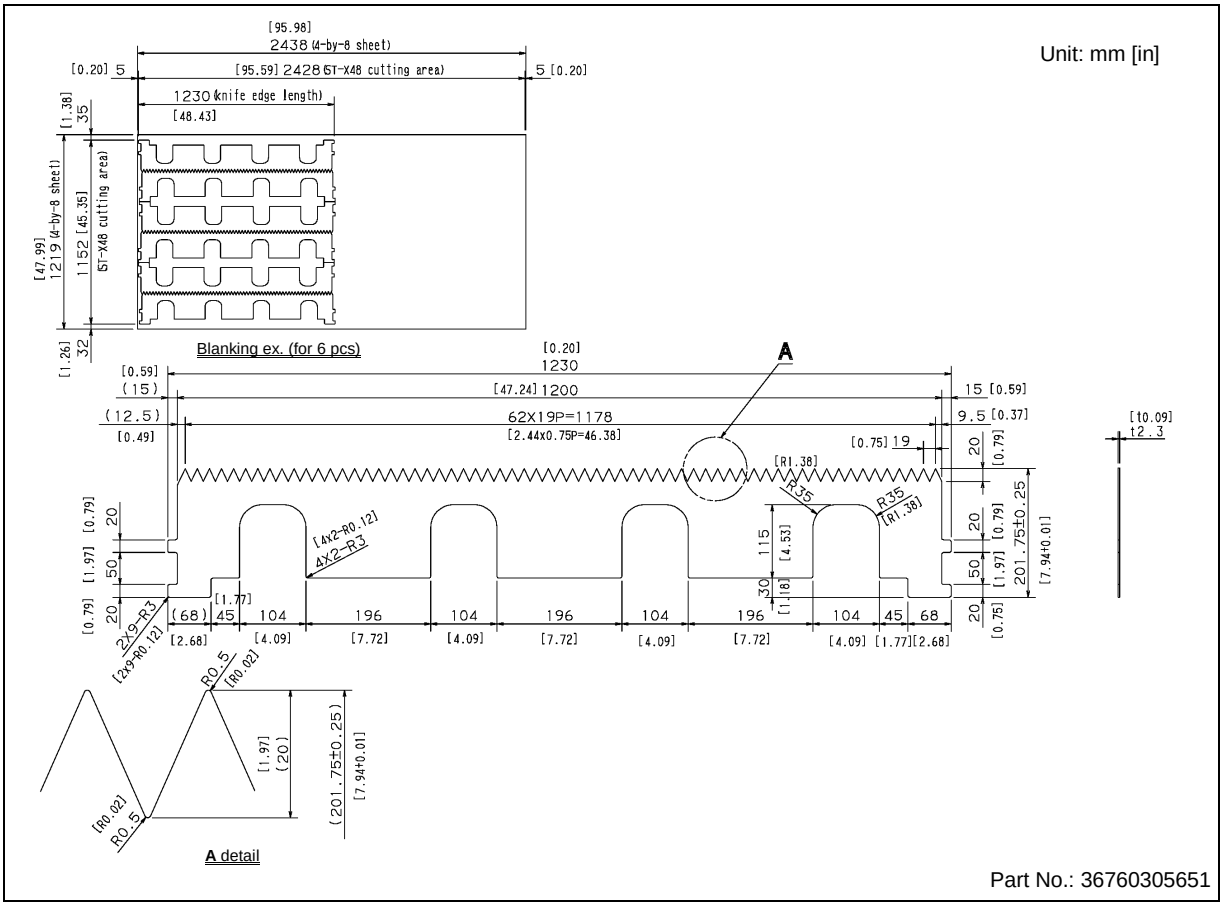


Fig. 4-69 Knife edge (No. 62)

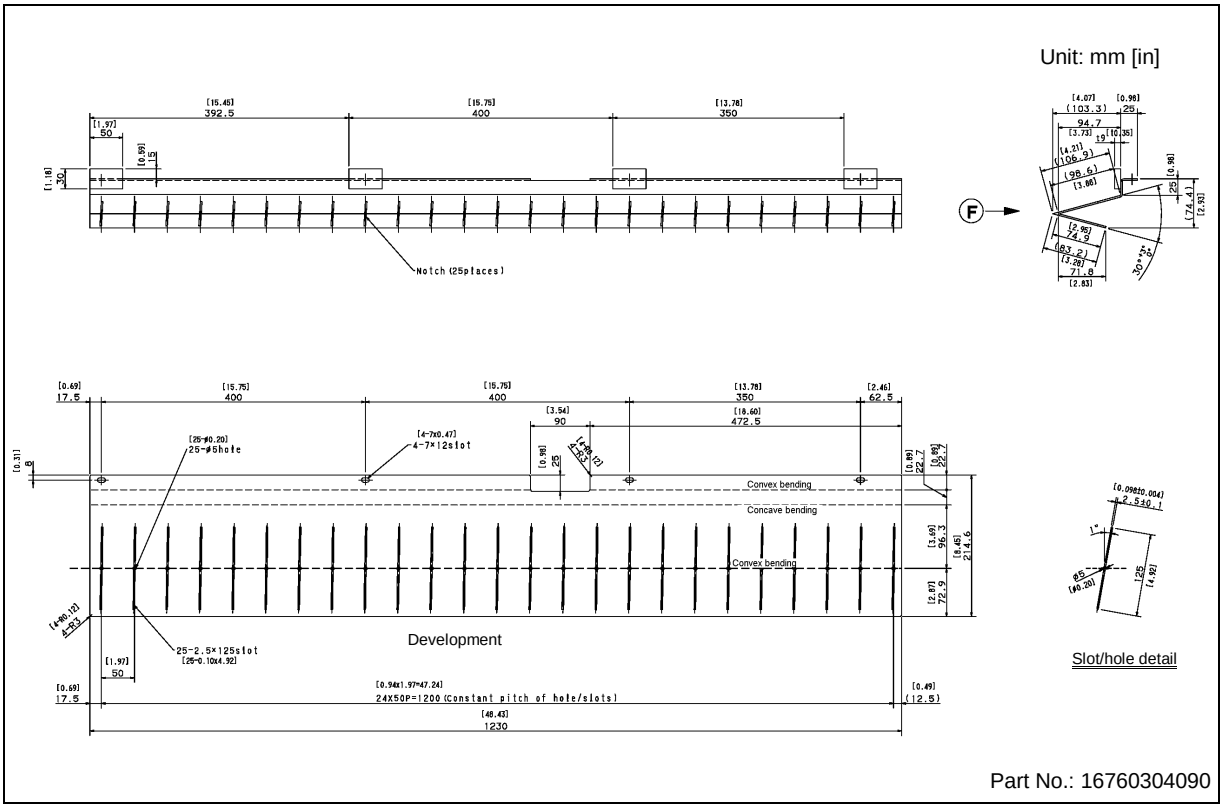
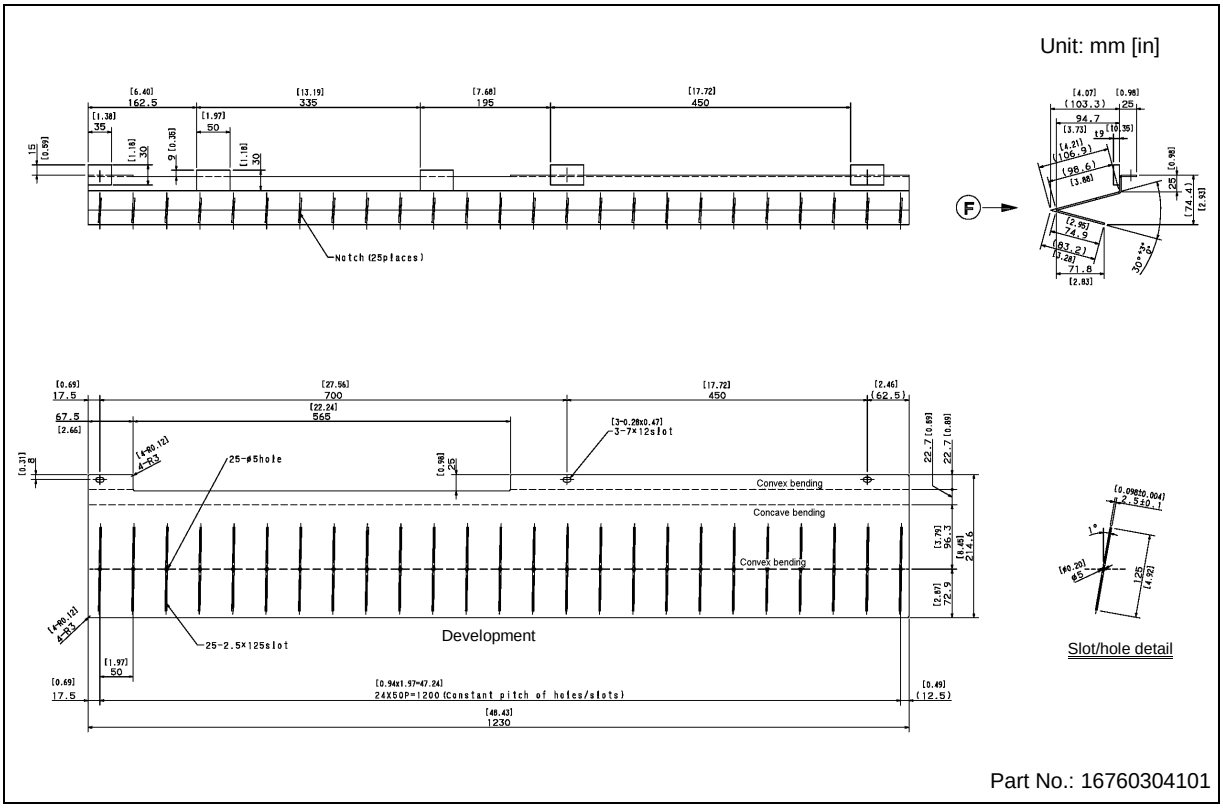


Fig. 4-70 Bracket (No. 63)



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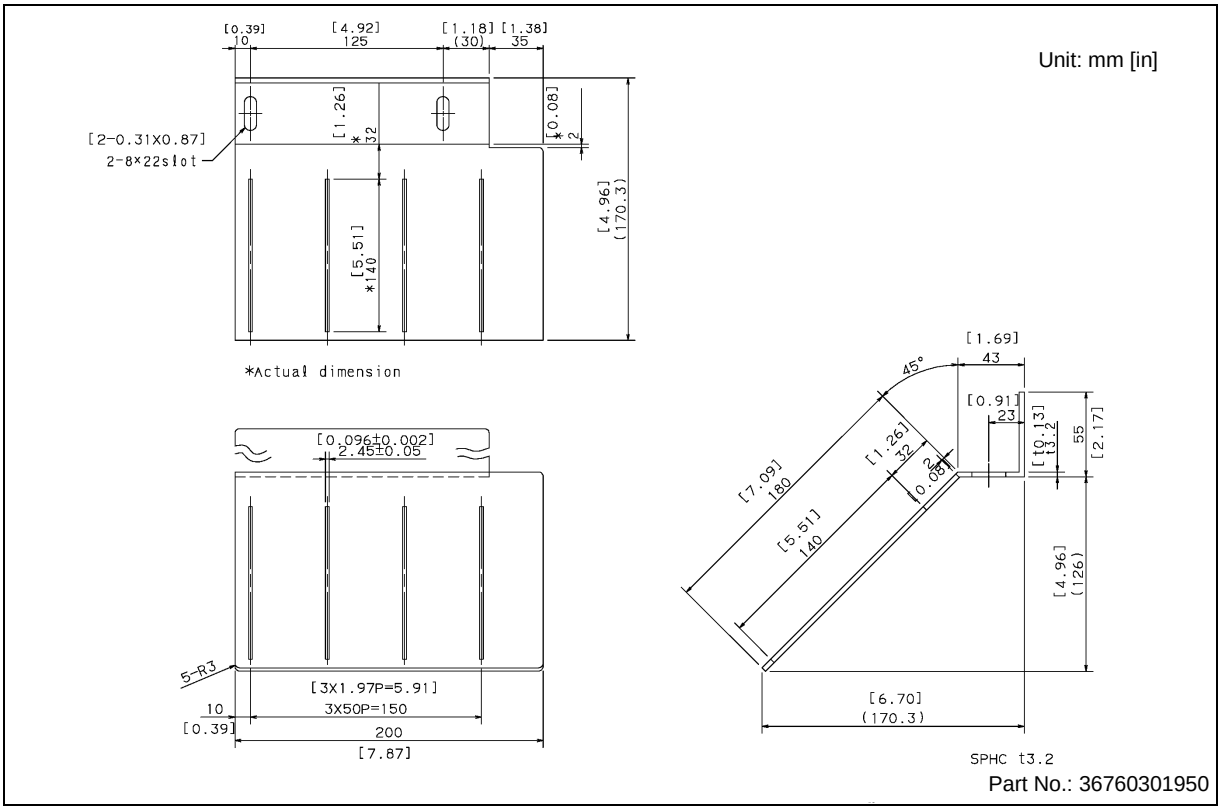

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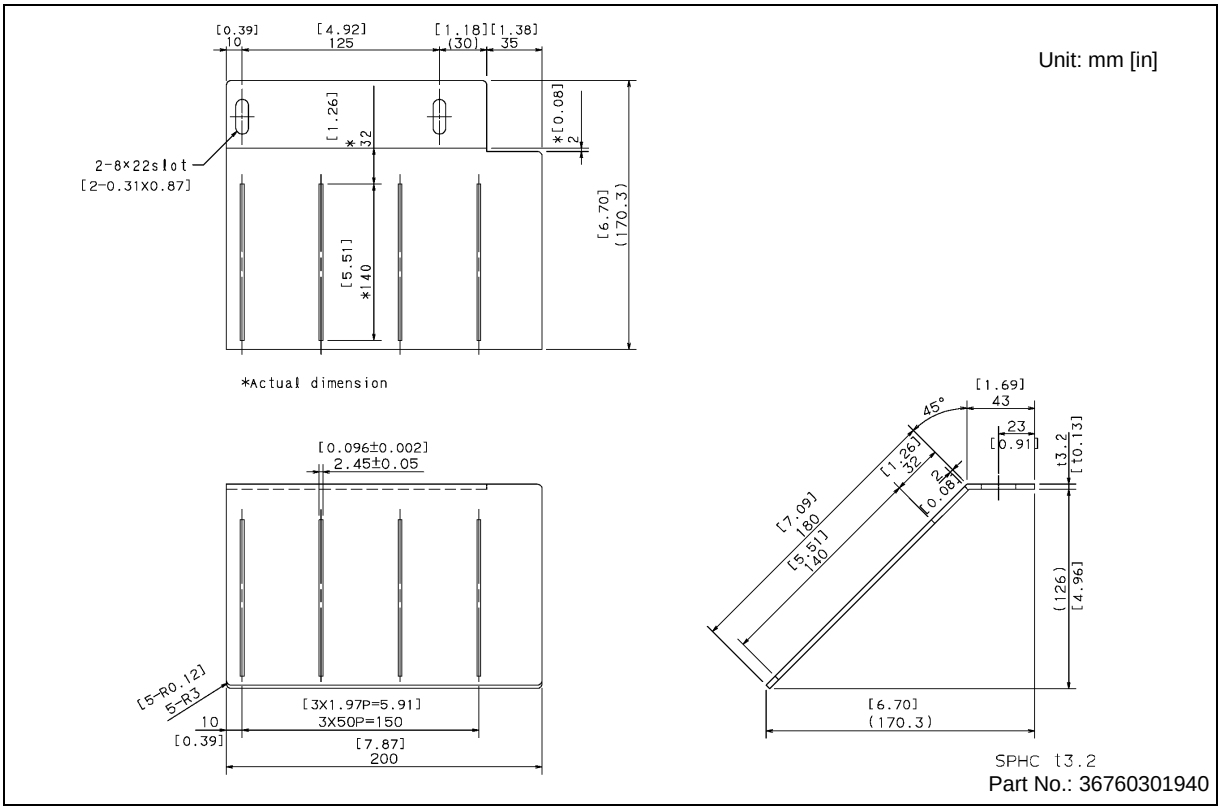

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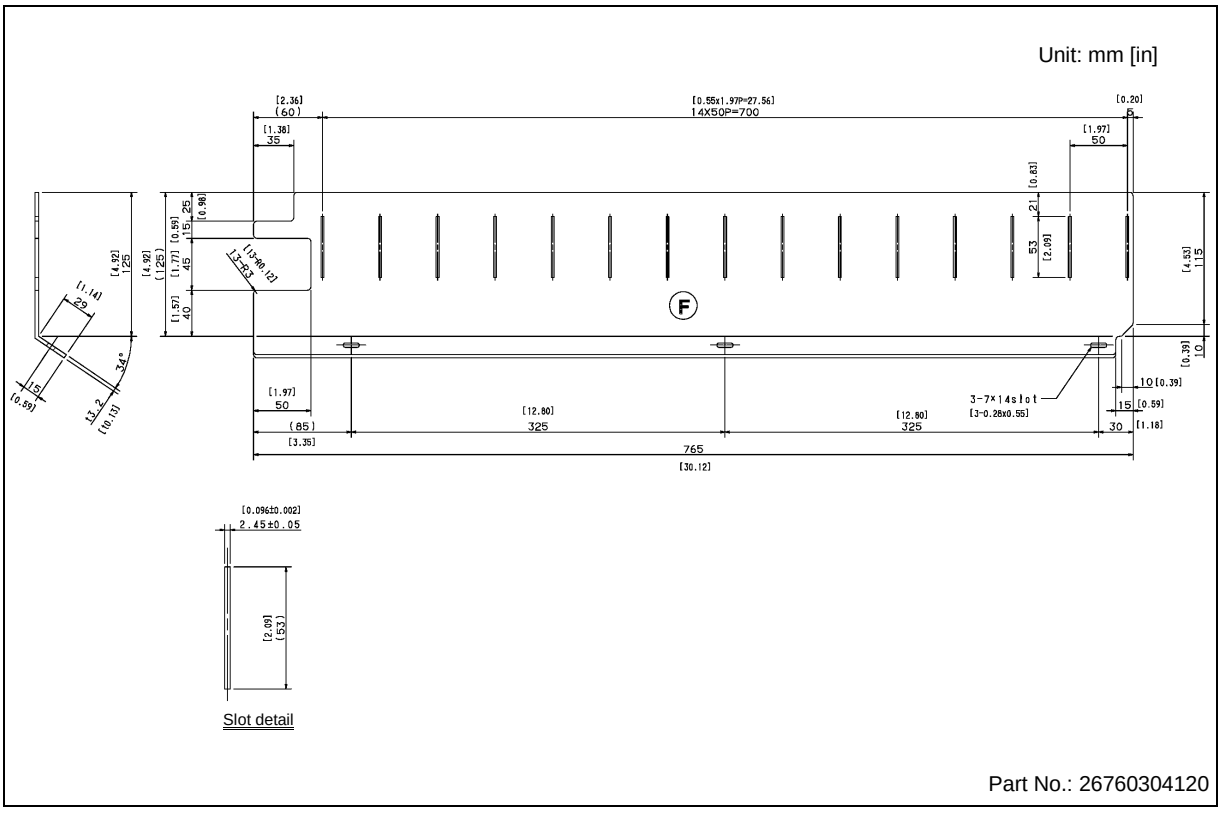
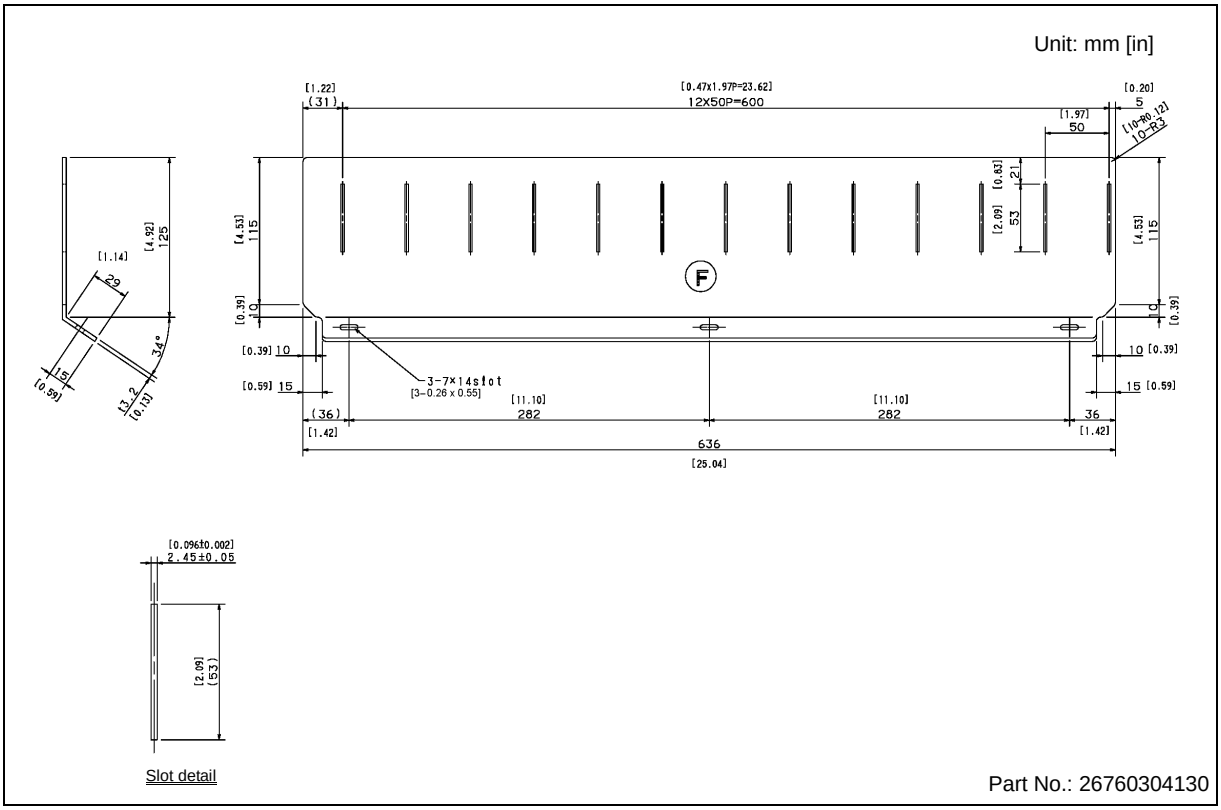


Fig. 4-74 Cover (No. 67)



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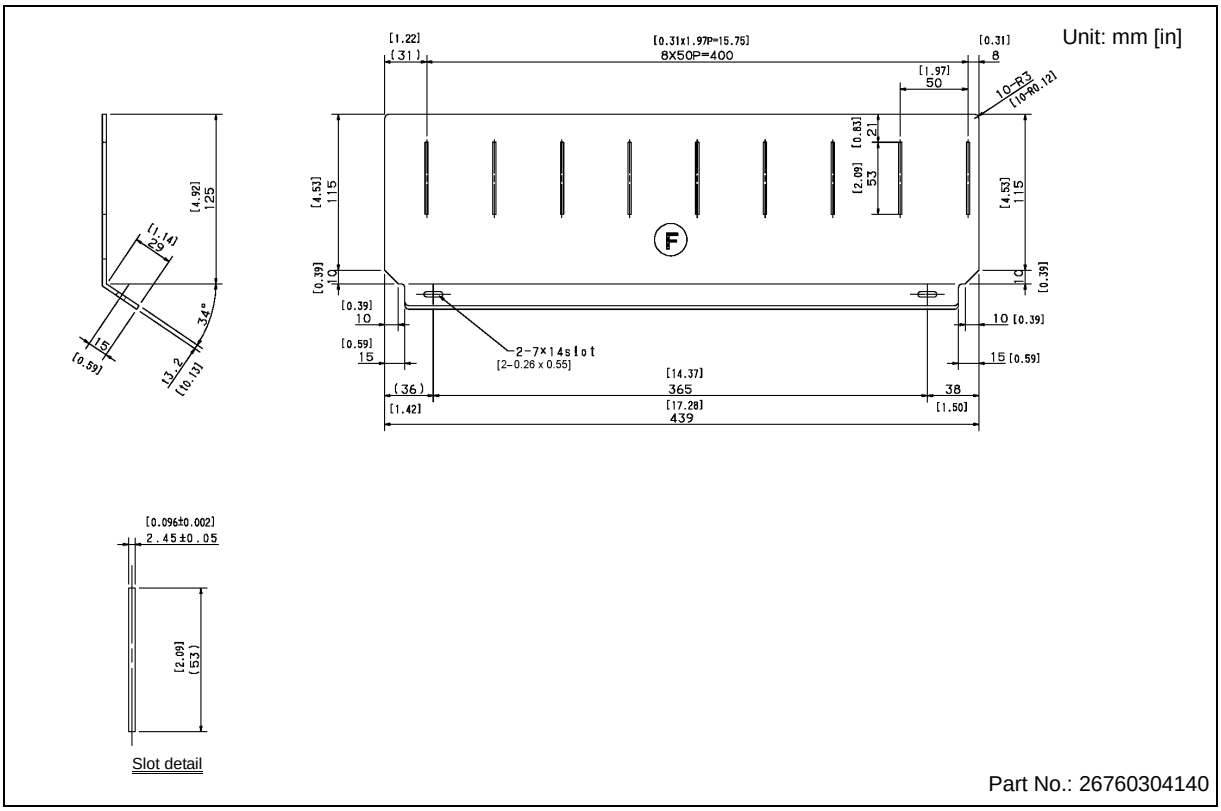

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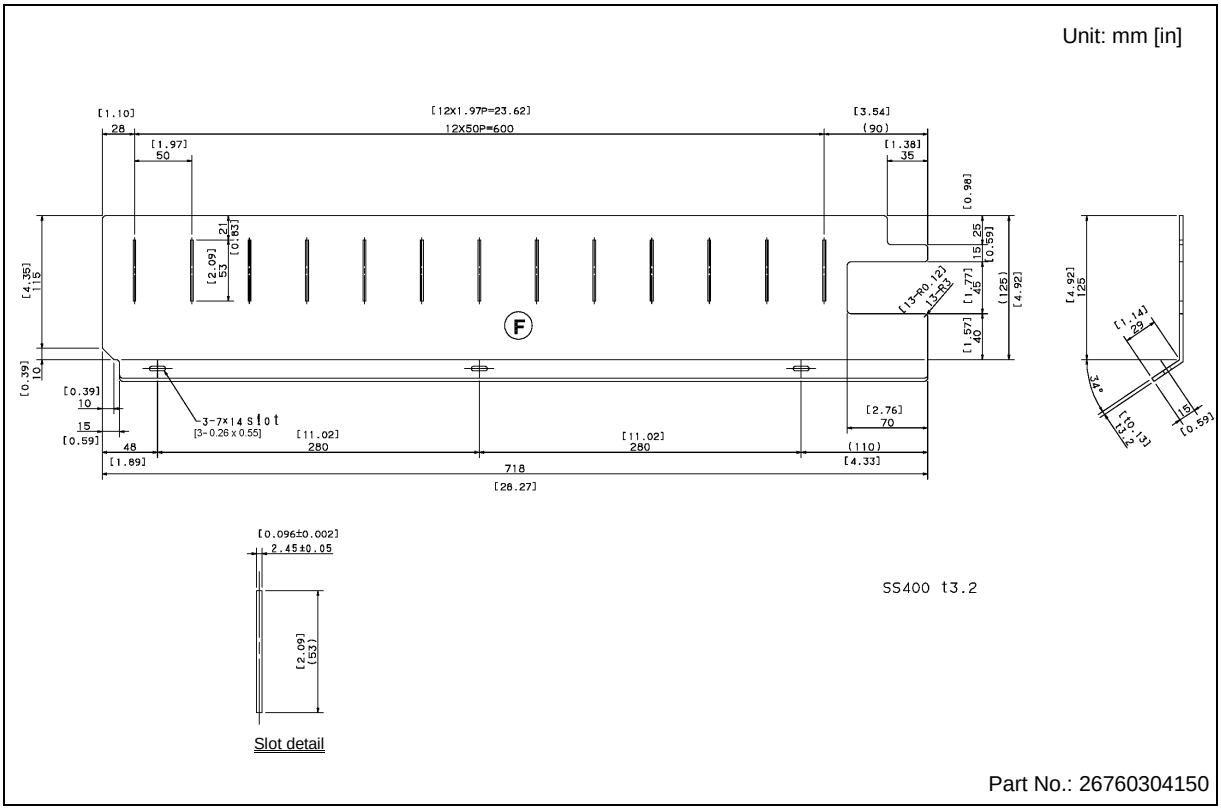

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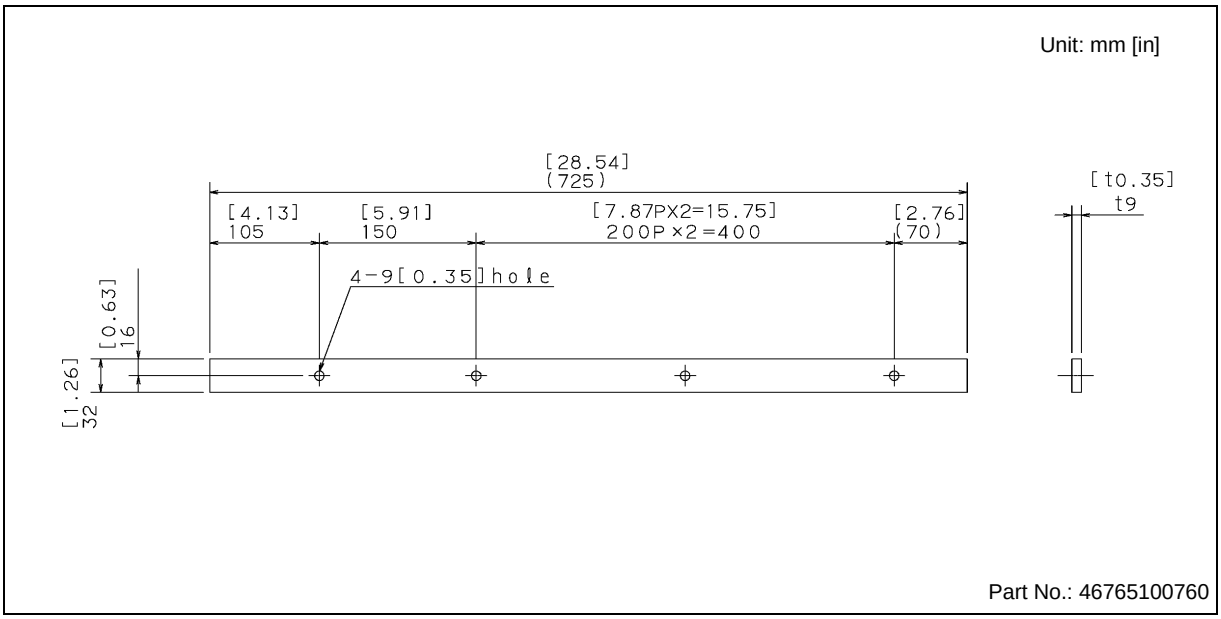

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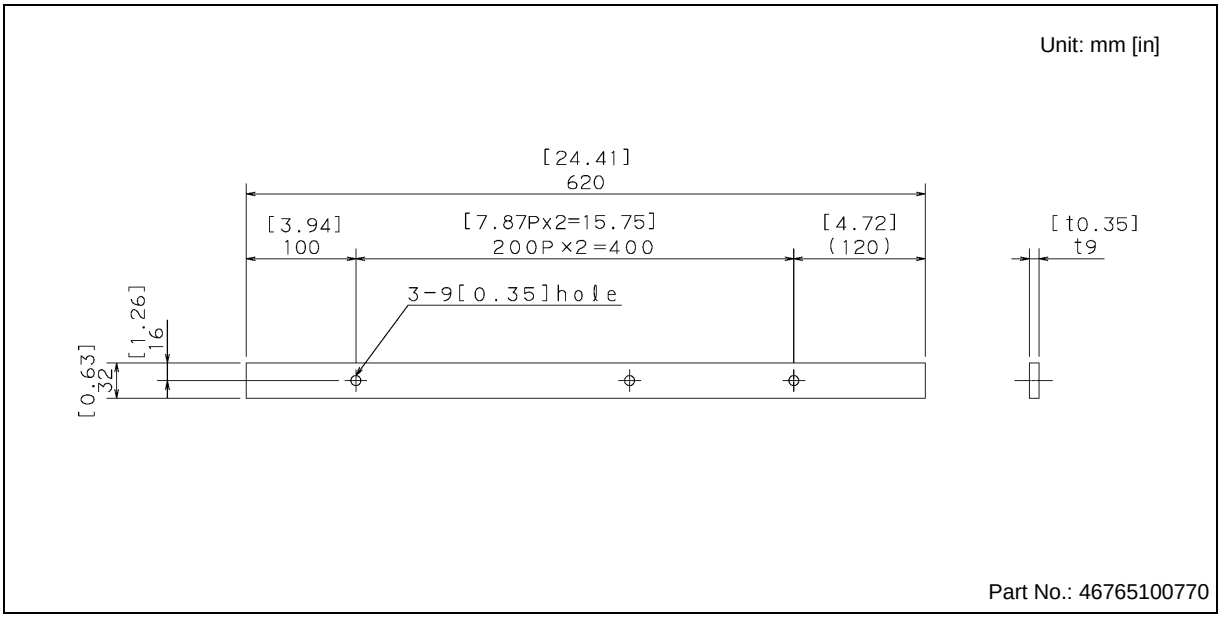

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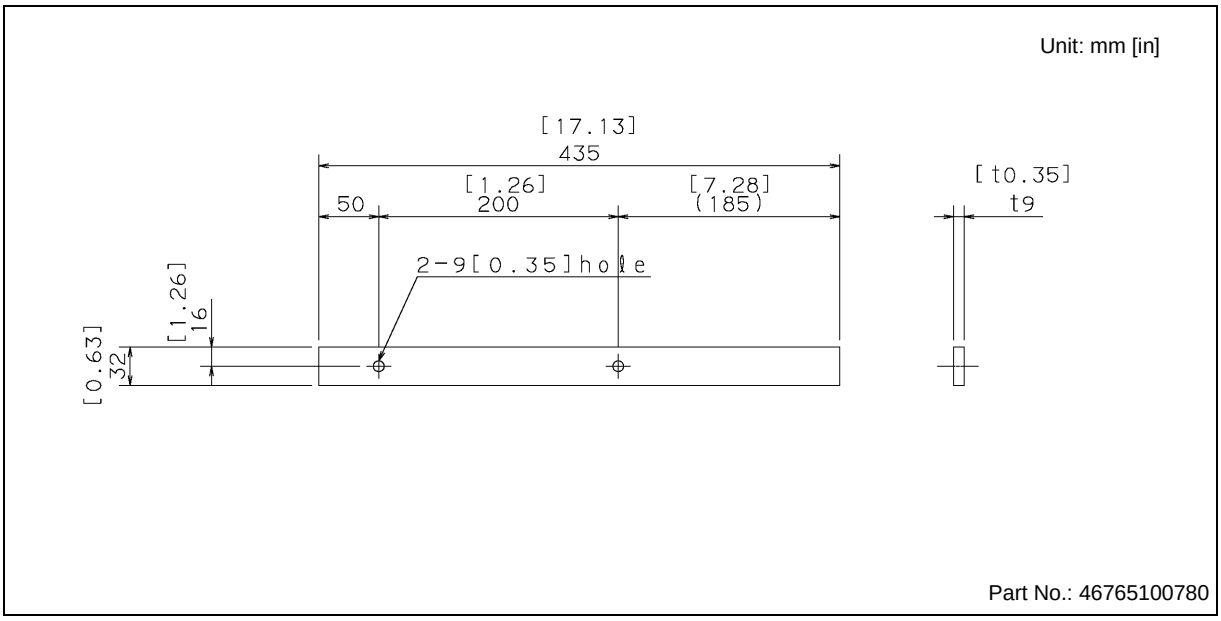

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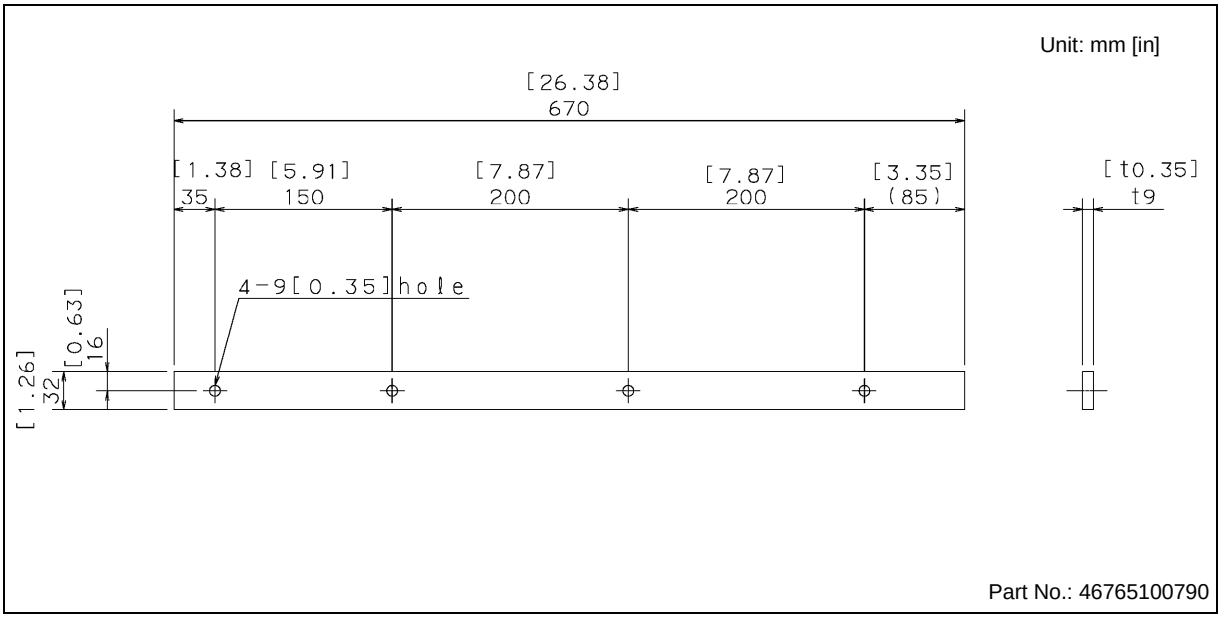
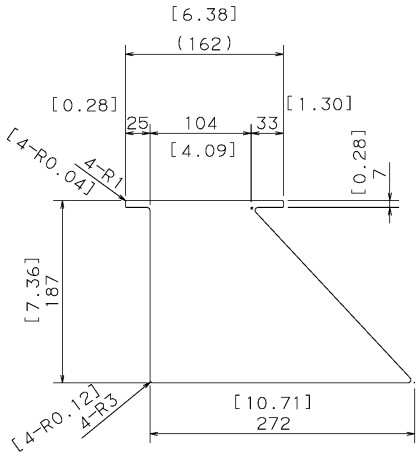


Fig. 4-81 Bar (No. 74)

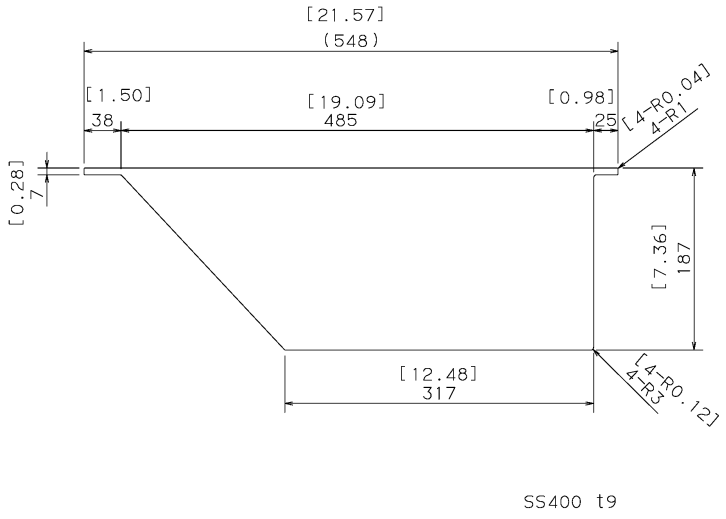
Unit: mm [in]



Part No.: 46760311590

Fig. 4-82 Plate (No. 75)

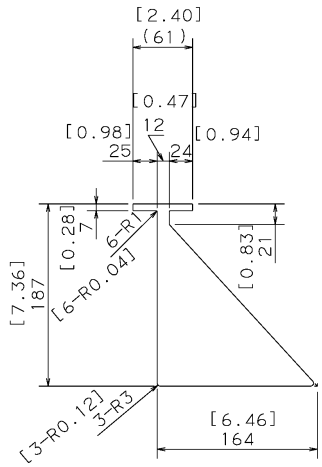
Unit: mm [in]



Part No.: 46760311600

Fig. 4-83 Plate (No. 76)

Unit: mm [in]

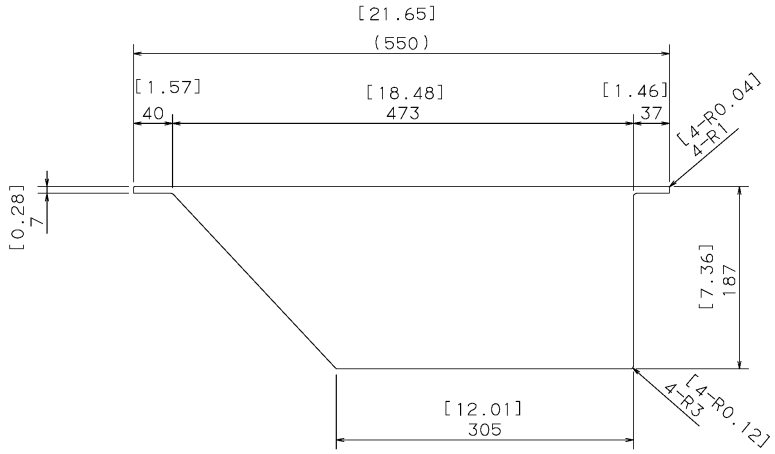


SS400 t9

Part No.: 46760311610

Fig. 4-84 Plate (No. 77)

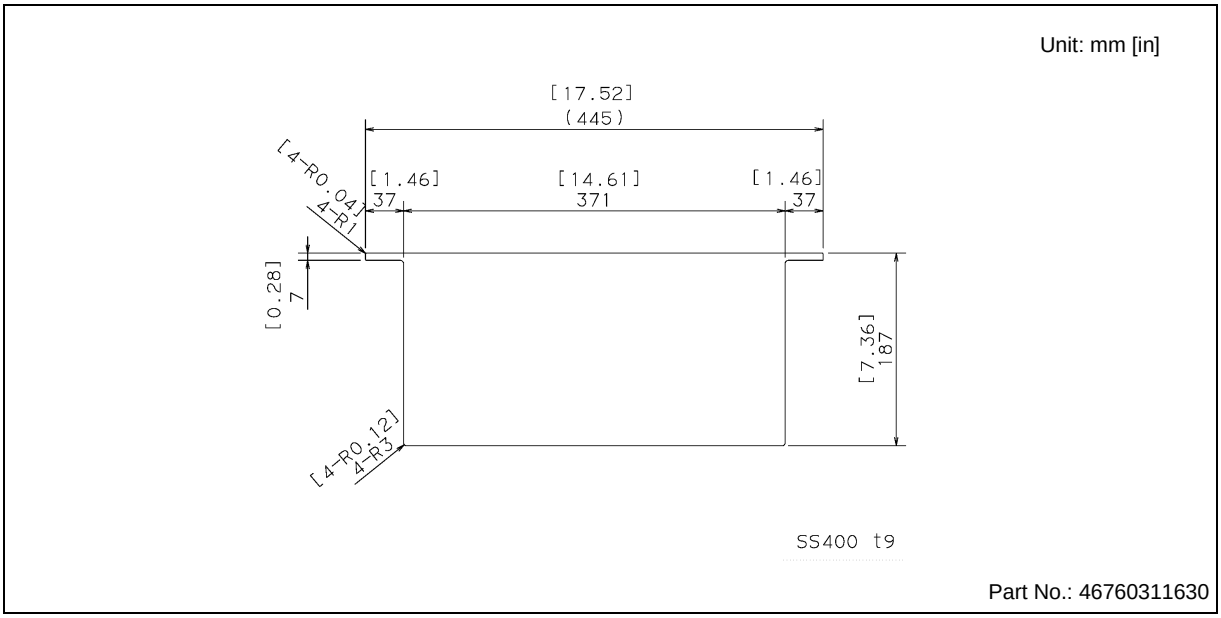
Unit: mm [in]



SS400 t9

Part No.: 46760311620

Fig. 4-85 Plate (No. 78)



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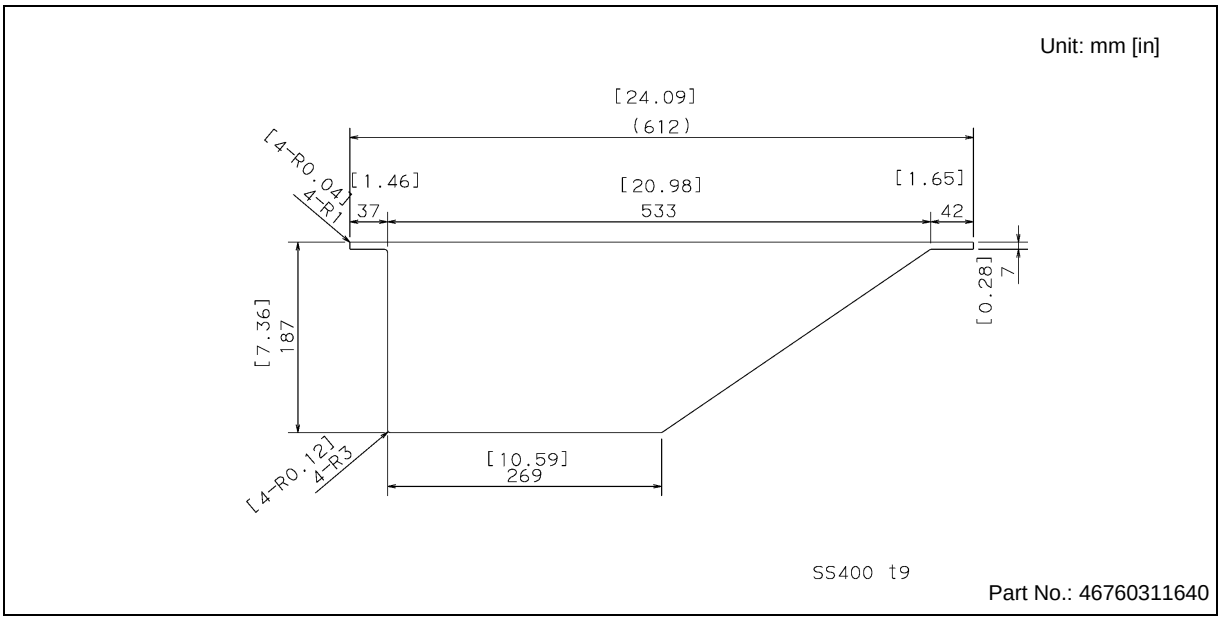

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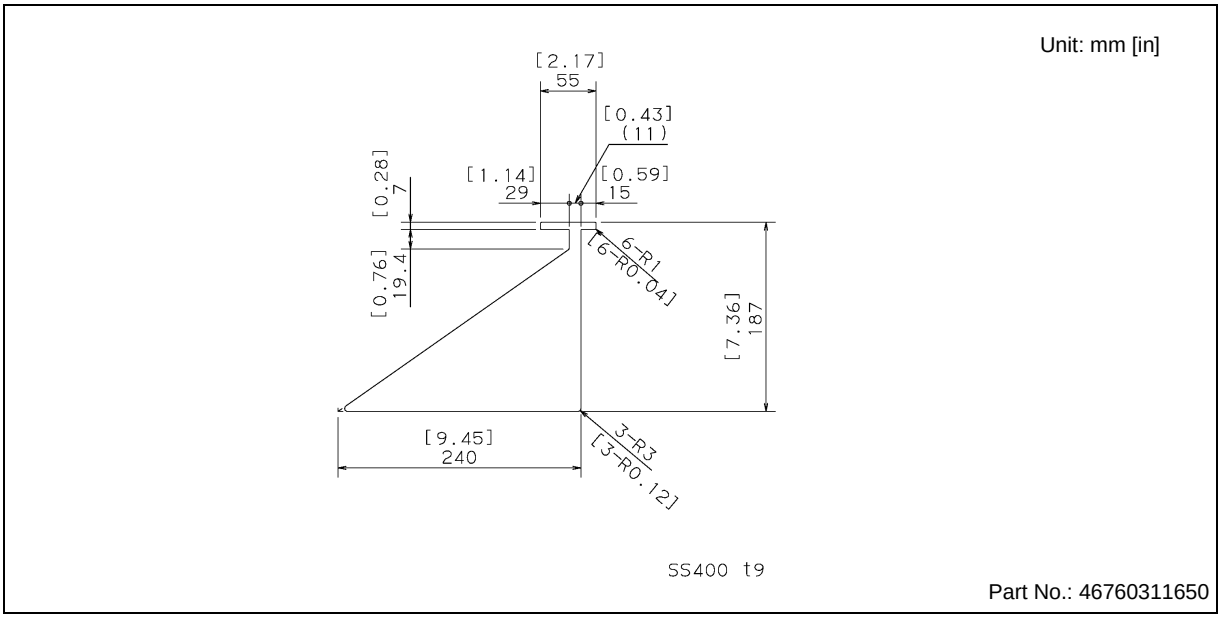

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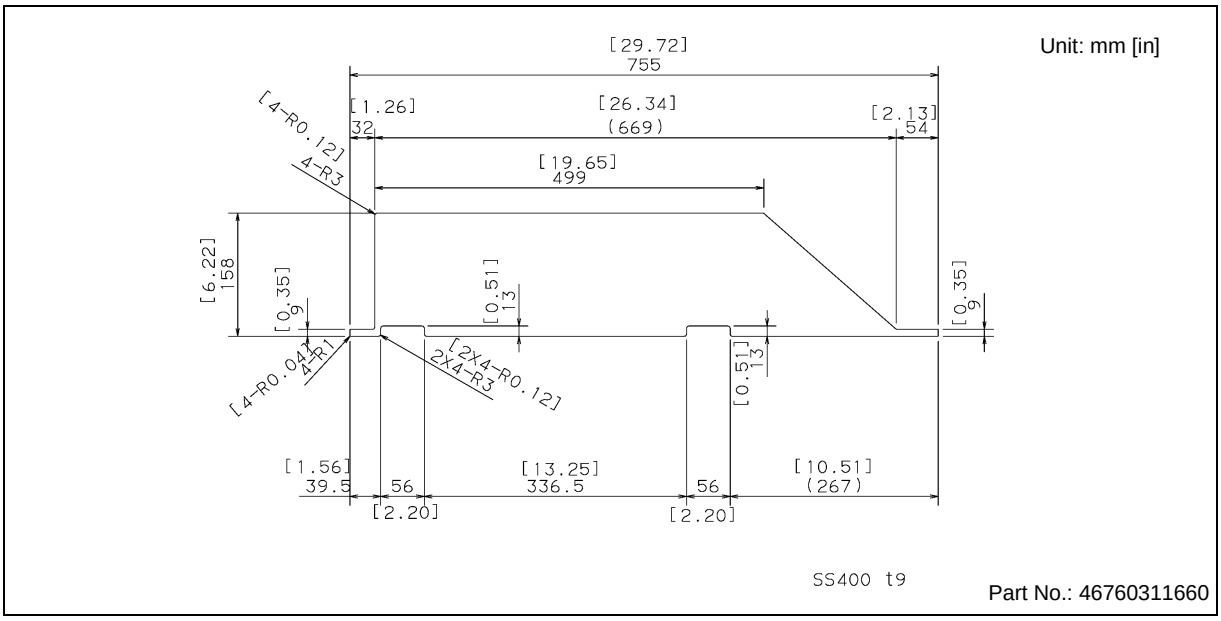

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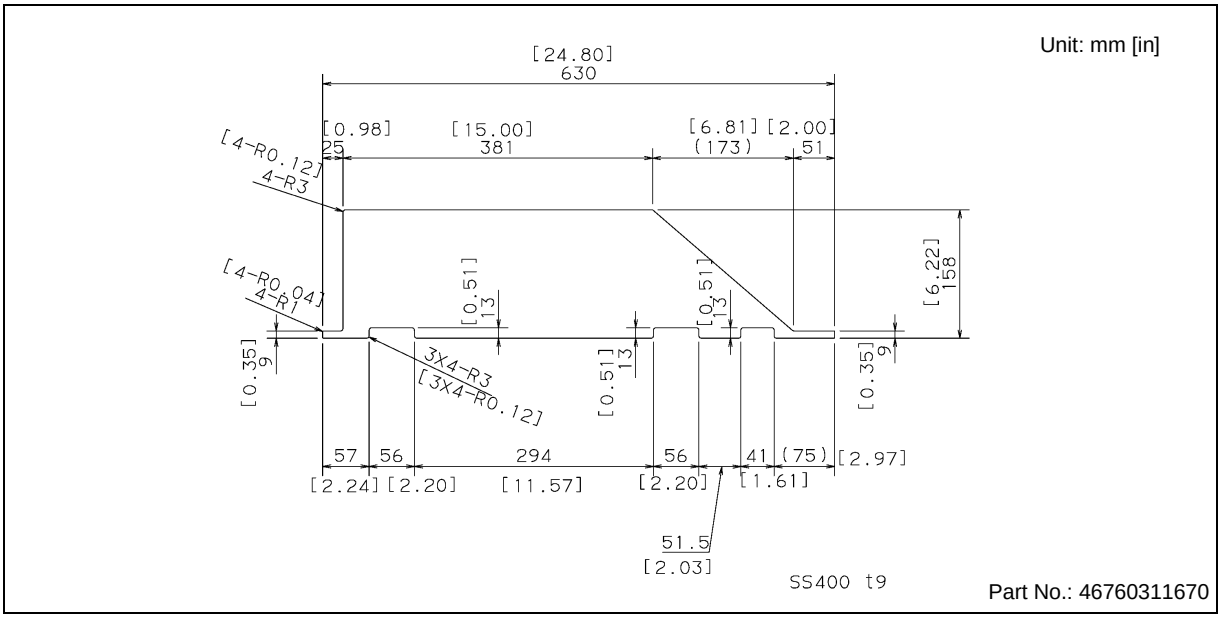

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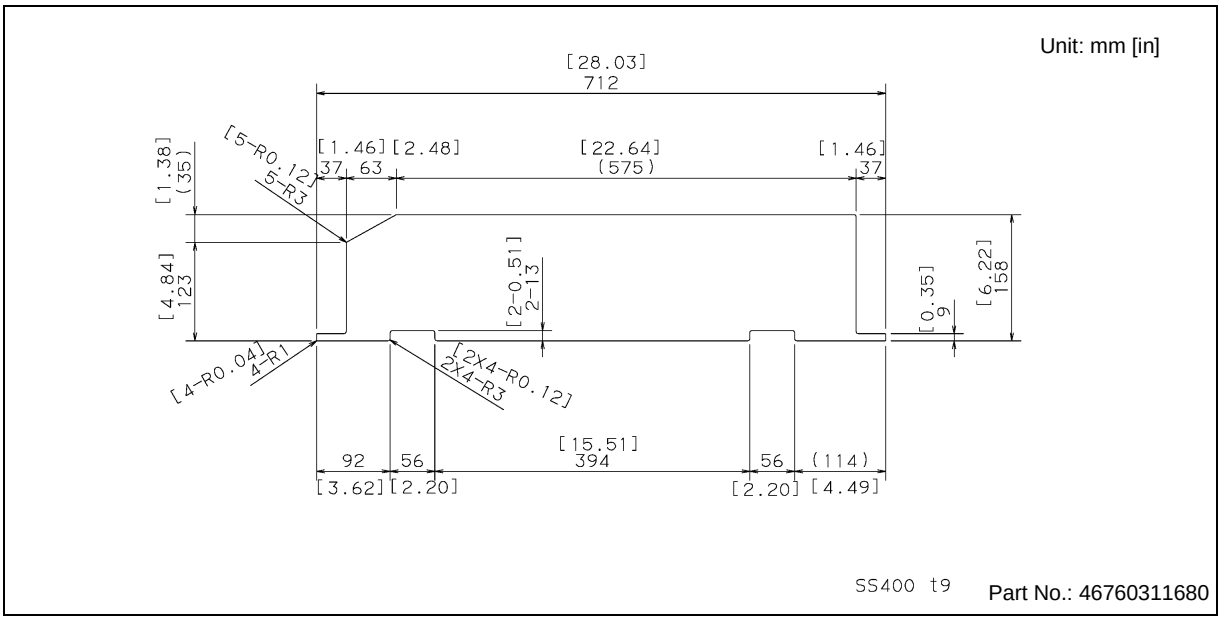
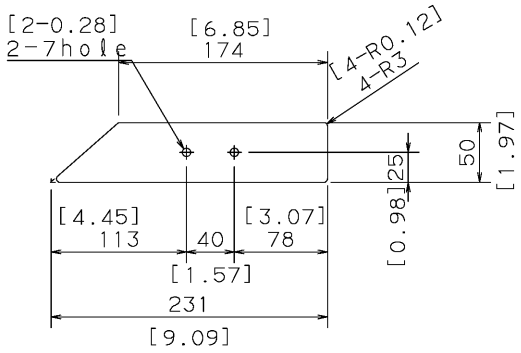


Fig. 4-91 Plate (No. 84)

Unit: mm [in]

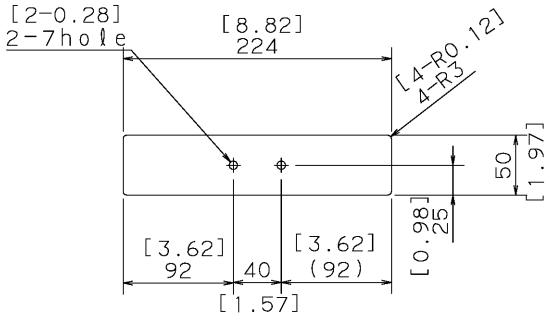


SS400 t9

Part No.: 46760311720

Fig. 4-92 Plate (No. 85)

Unit: mm [in]



SS400 t9

Part No.: 46760311730

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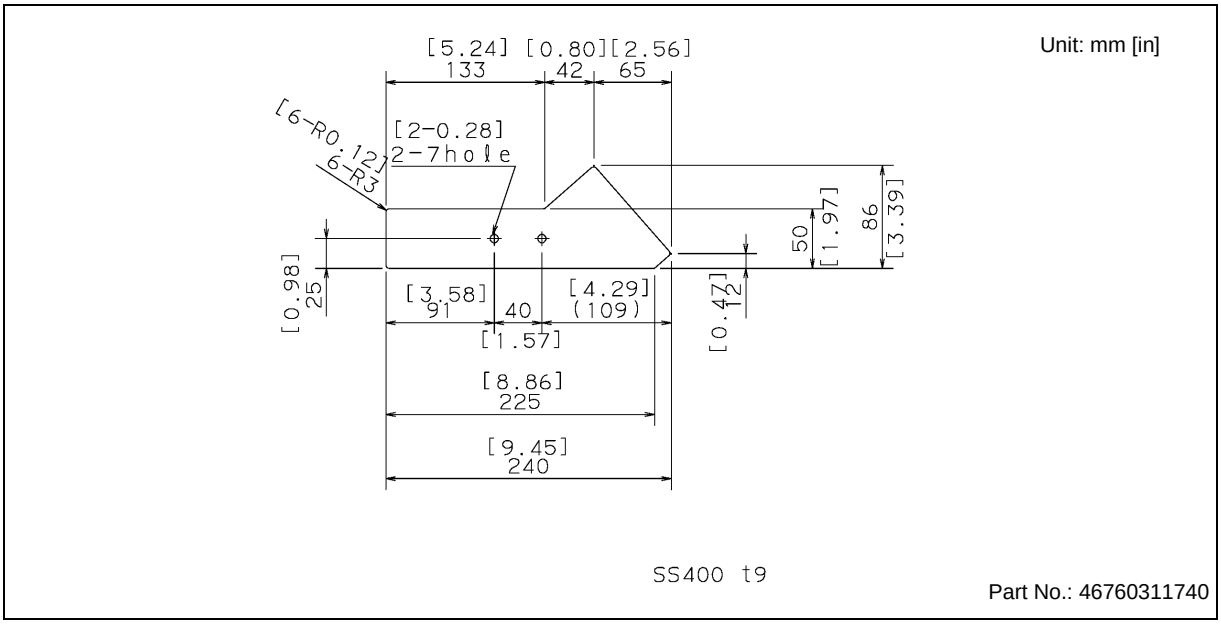

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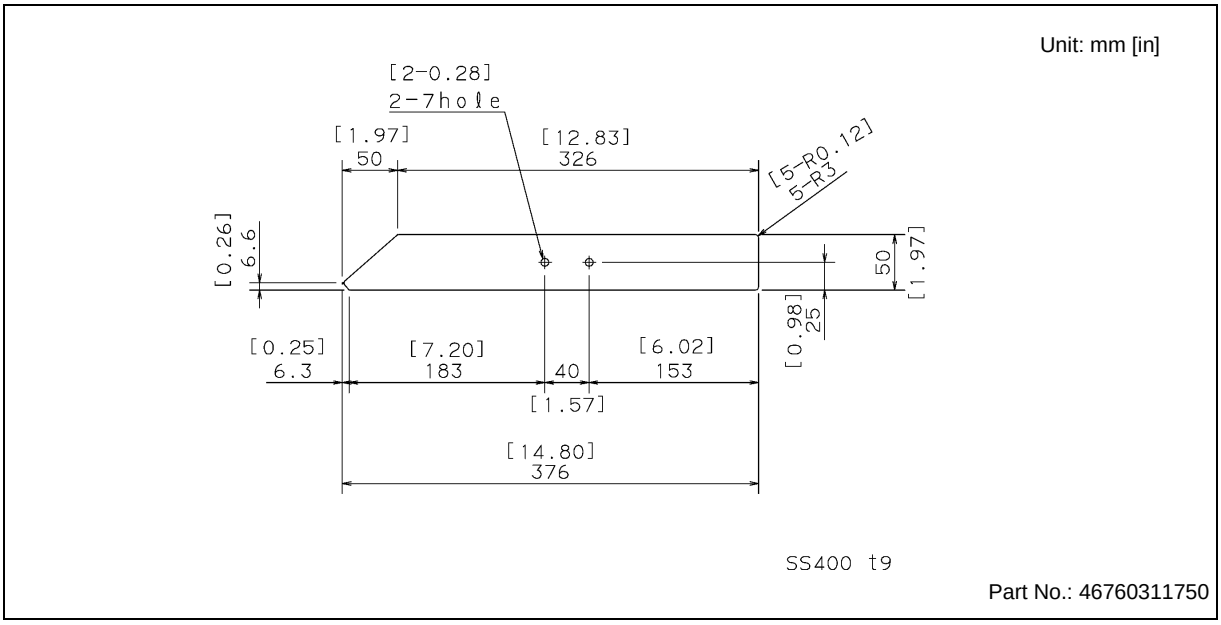
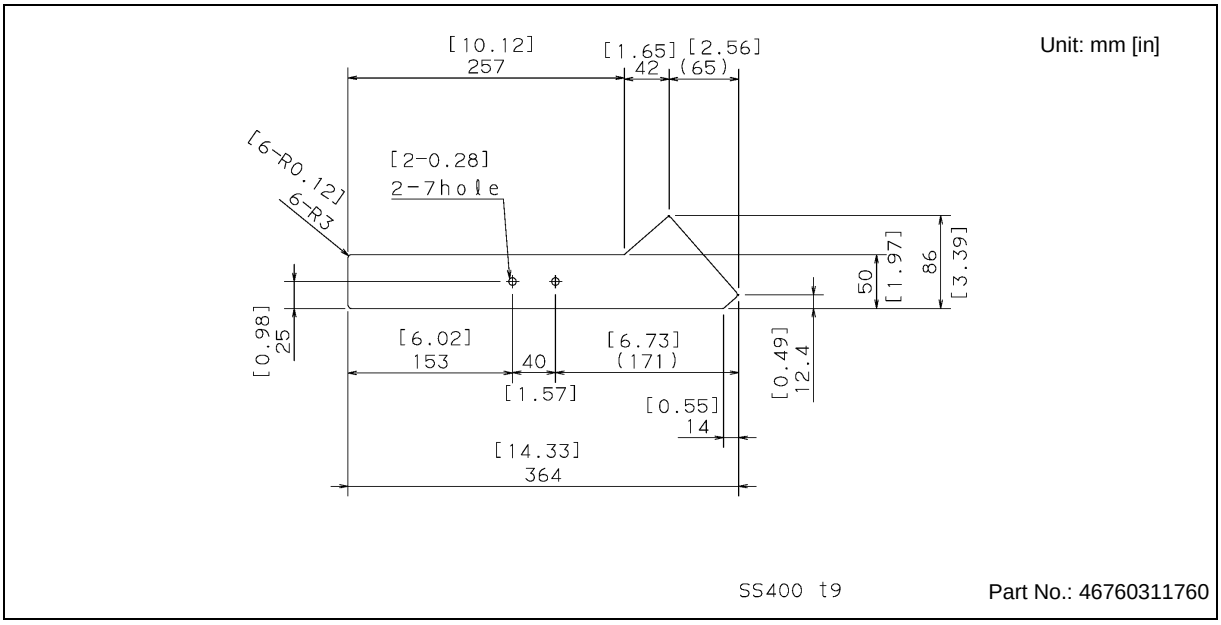


Fig. 4-95 Plate (No. 88)



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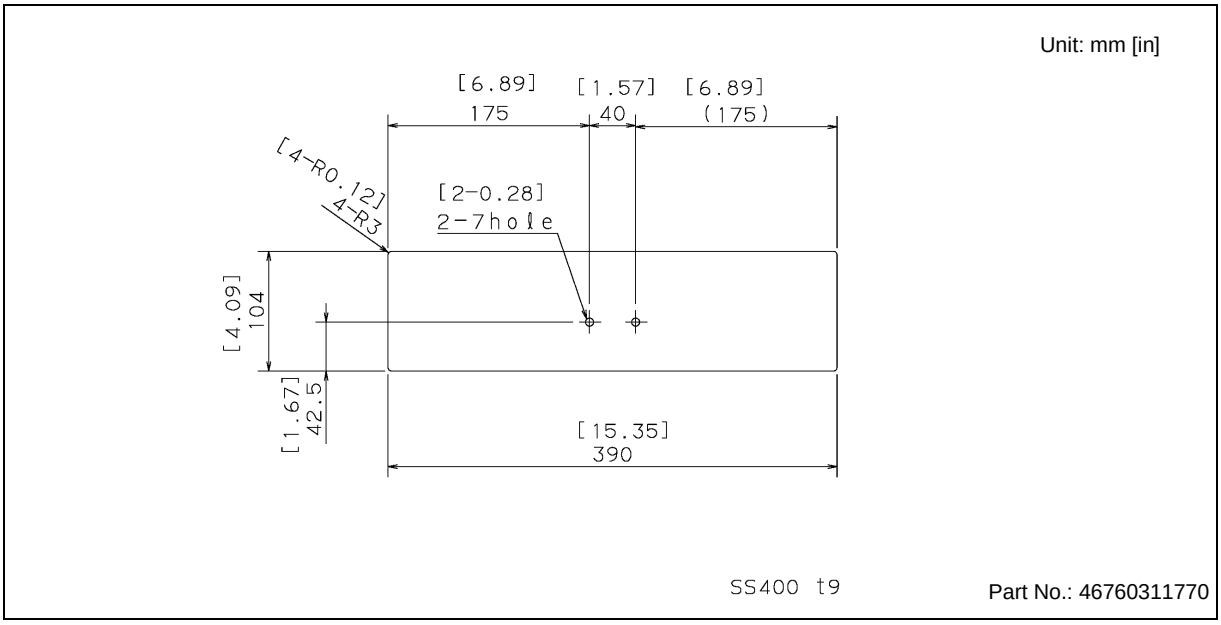

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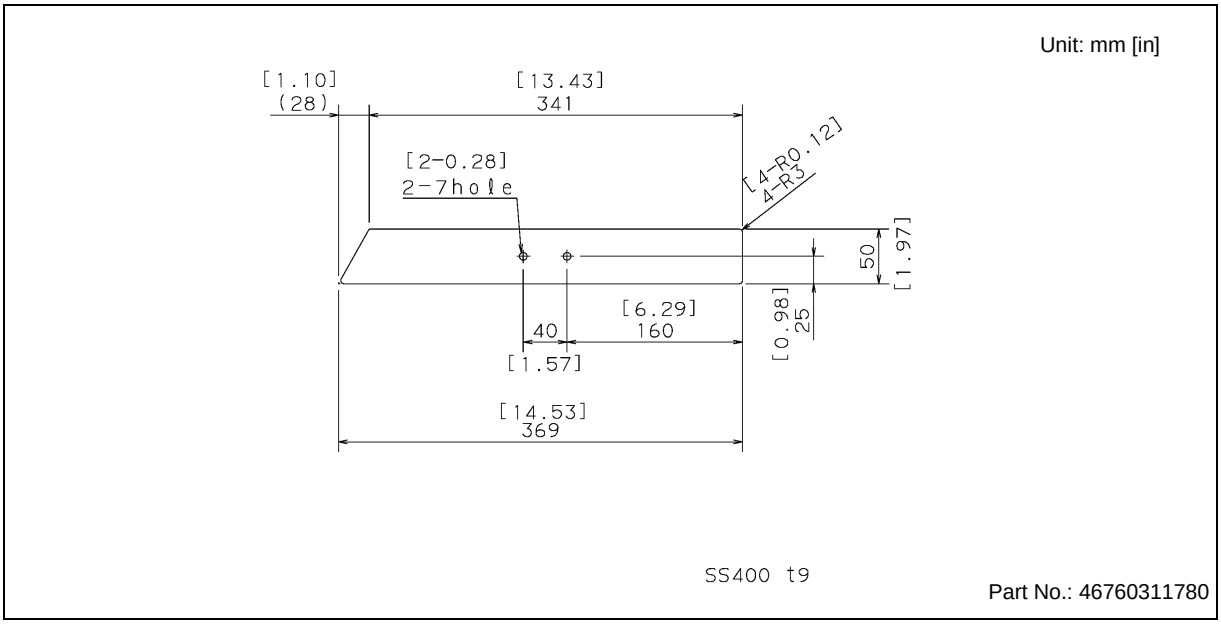
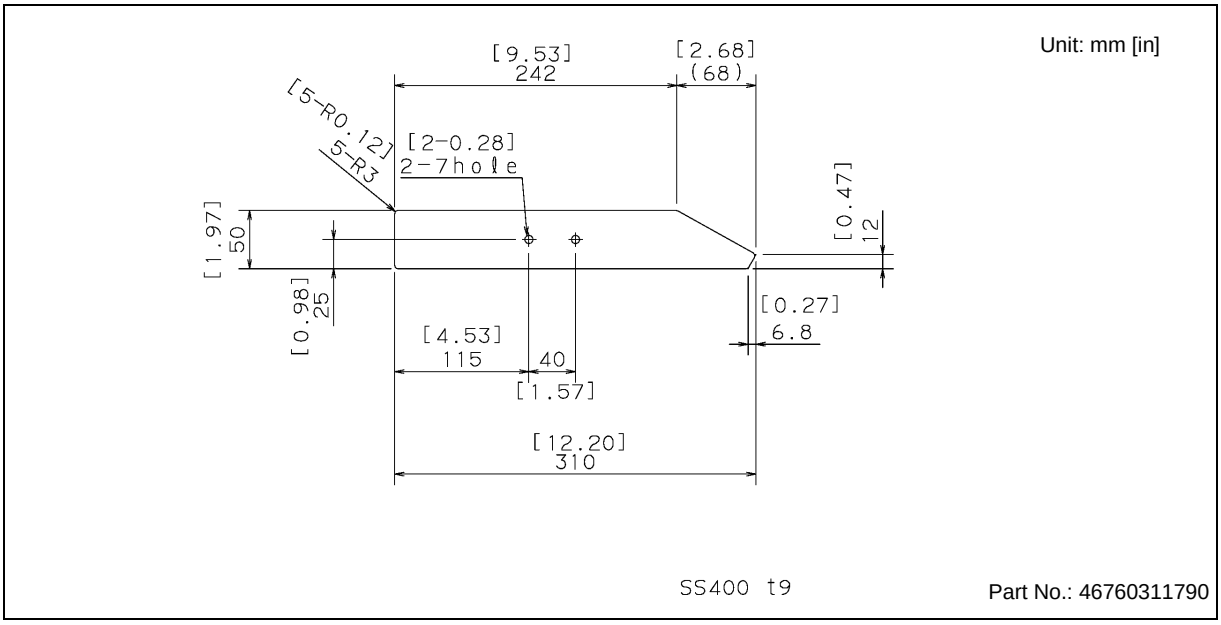


Fig. 4-98 Plate (No. 91)



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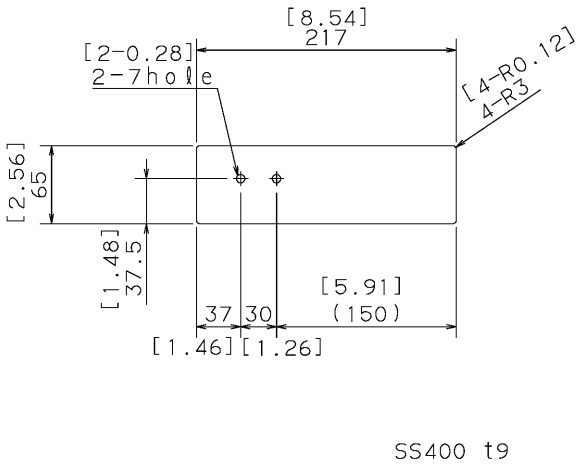
Unit: mm [in]



Part No.: 46760311800

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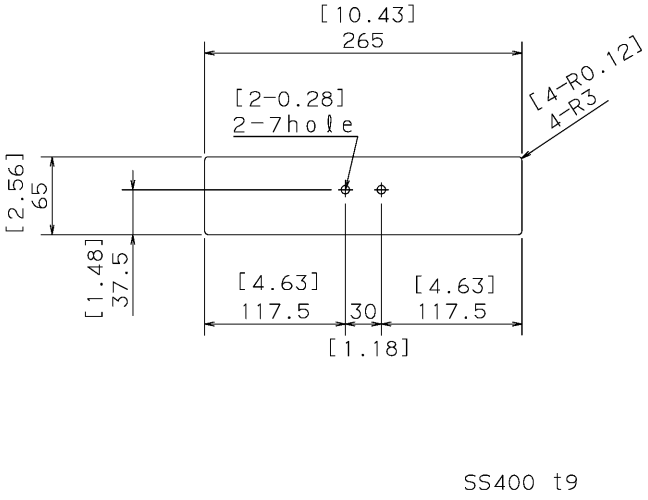
Unit: mm [in]



Part No.: 46760311810

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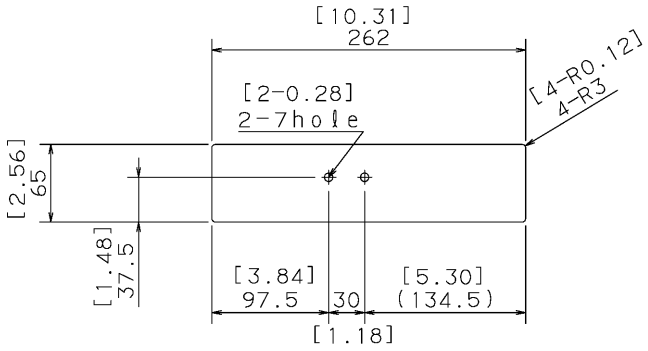
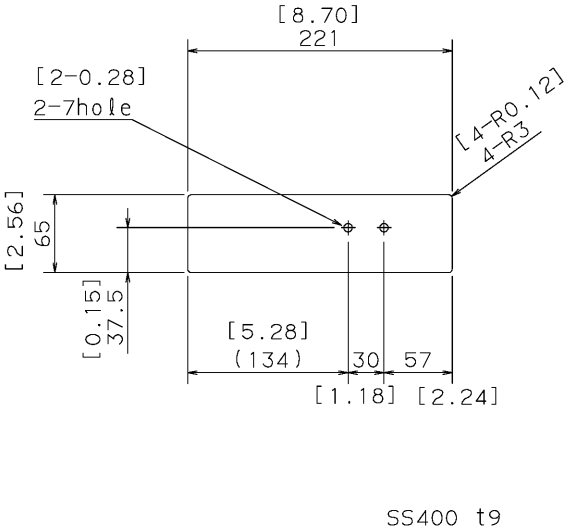
Unit: mm [in]



Part No.: 46760311820

Fig. 4-102 Plate (No. 95)

Unit: mm [in]



Part No.: 46760311830

Fig. 4-103 Plate (No. 96)

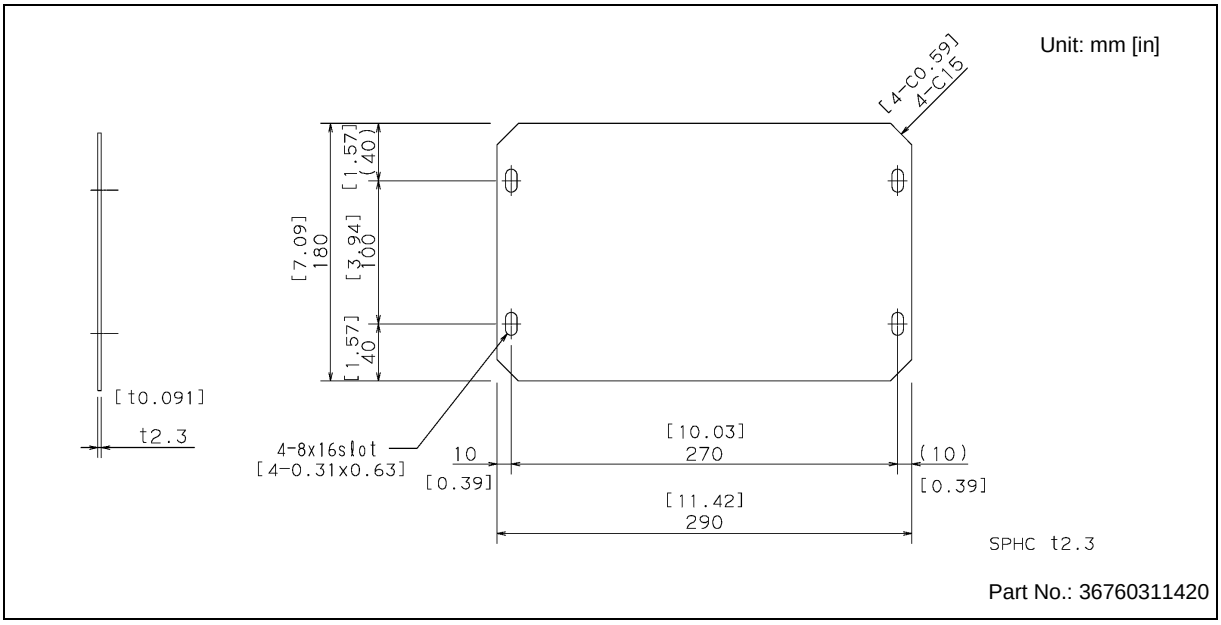
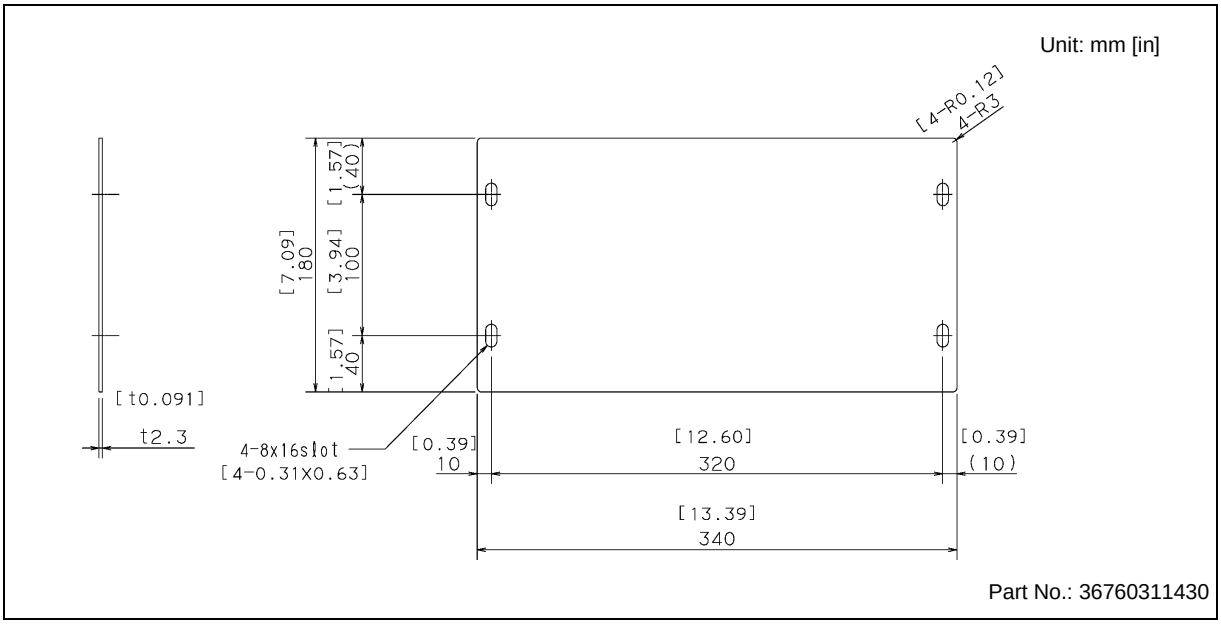


Fig. 4-104 Cover (No. 97)



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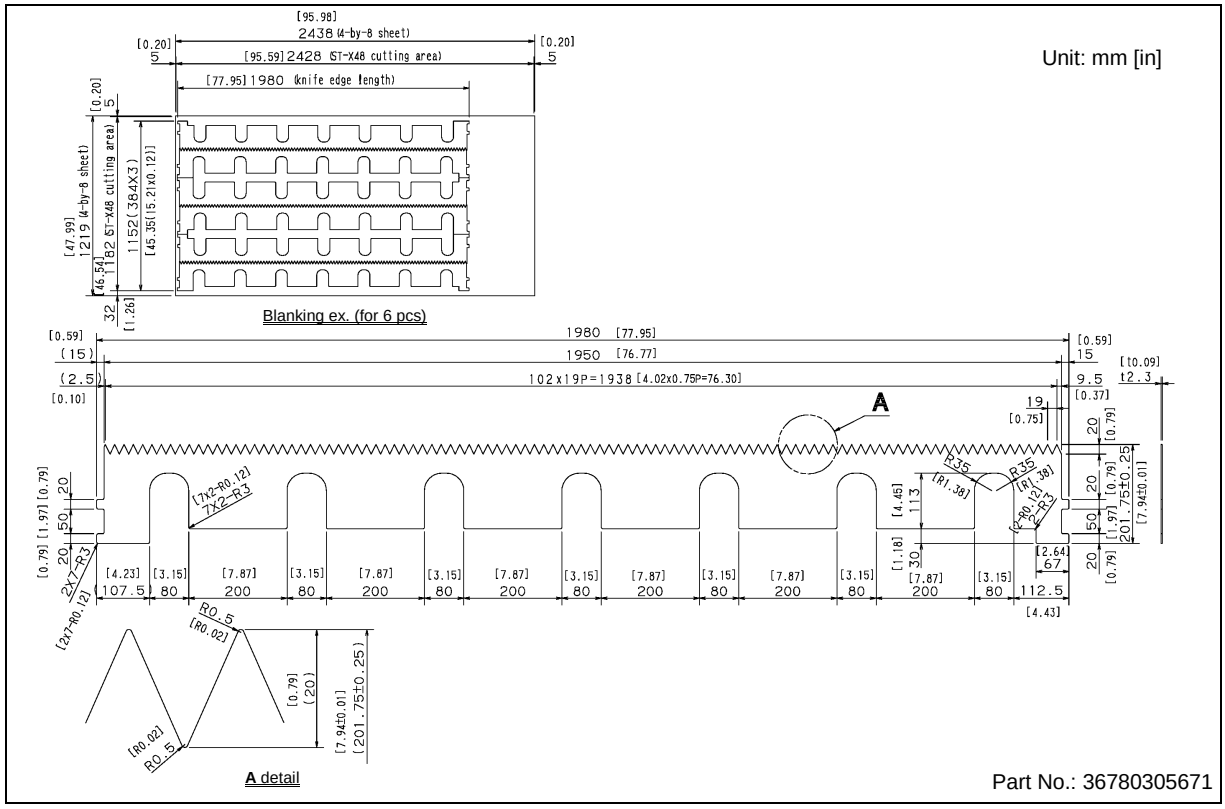


Fig. 4-106 Knife edge (No. 99)

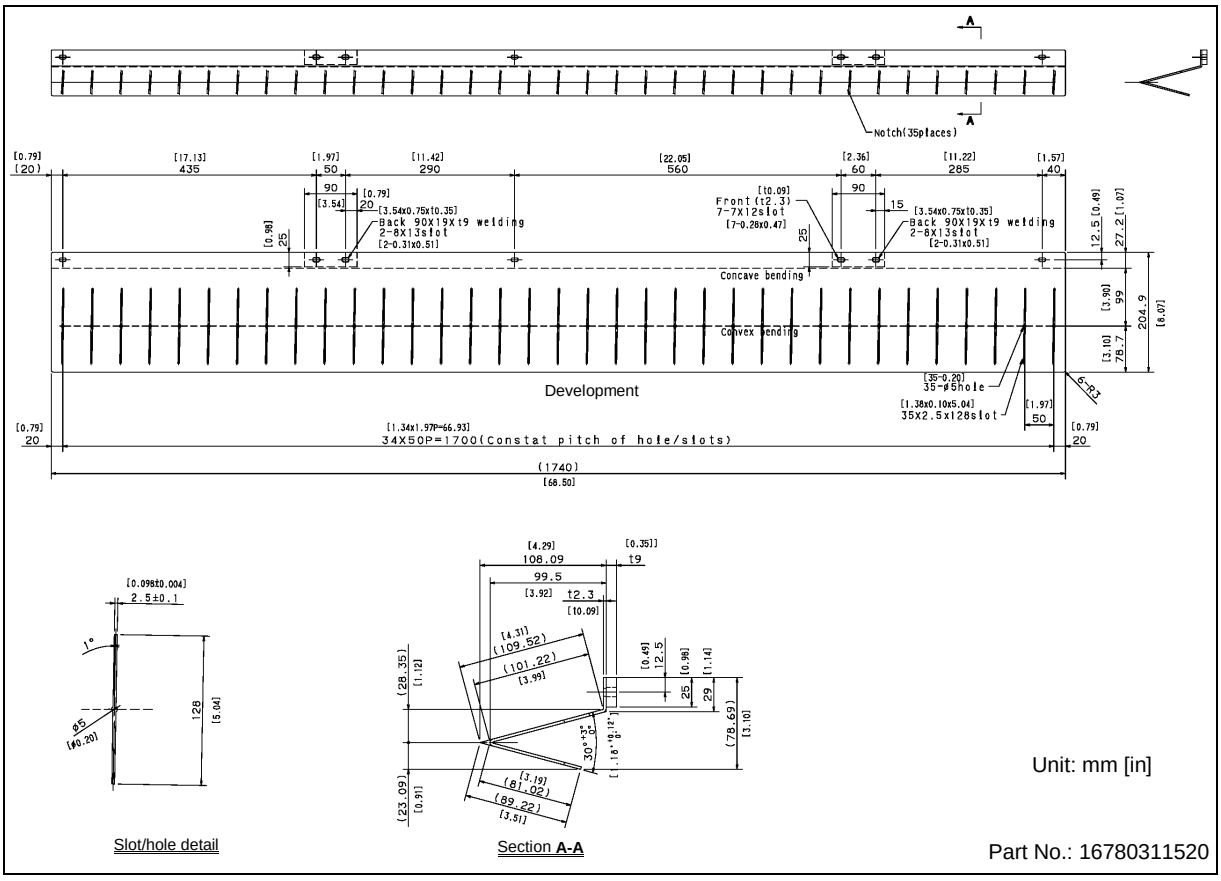
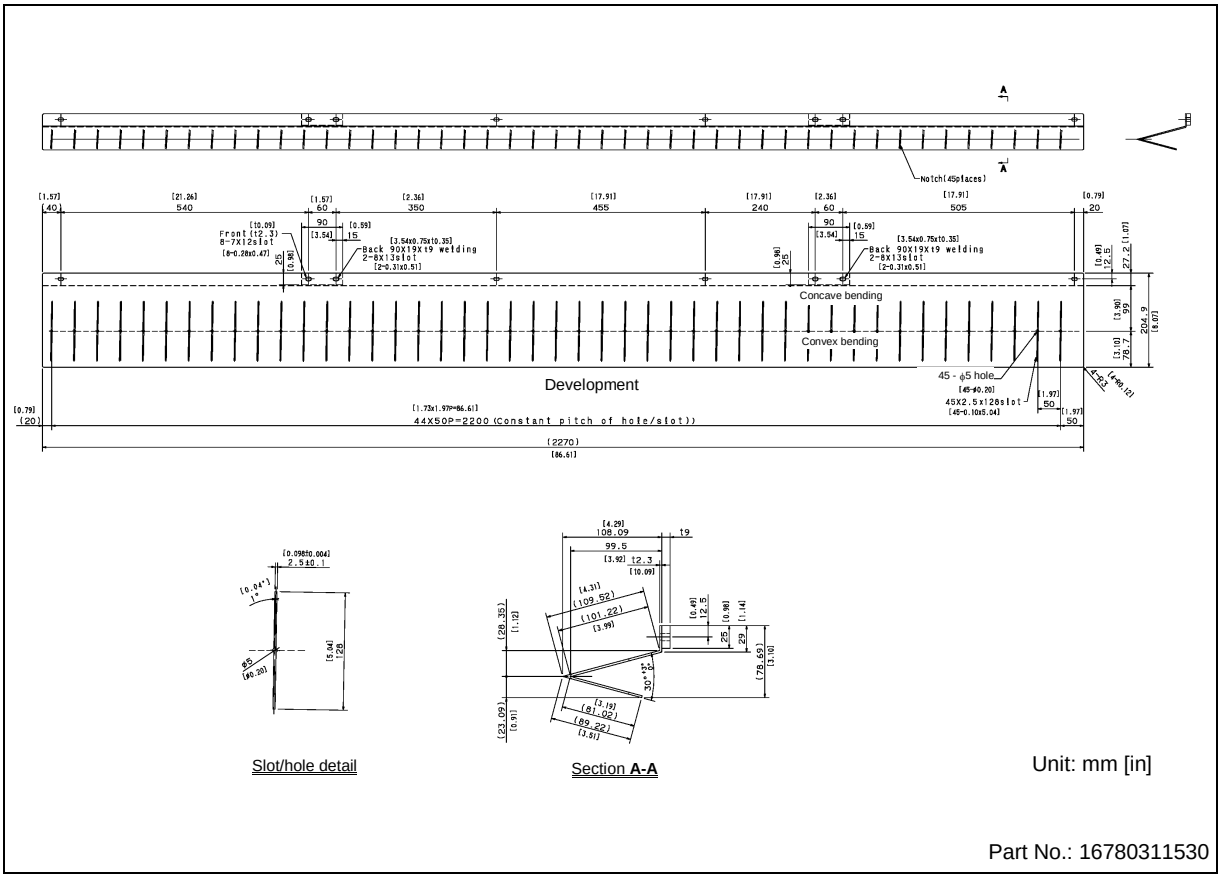


Fig. 4-107 Bracket (No. 100)



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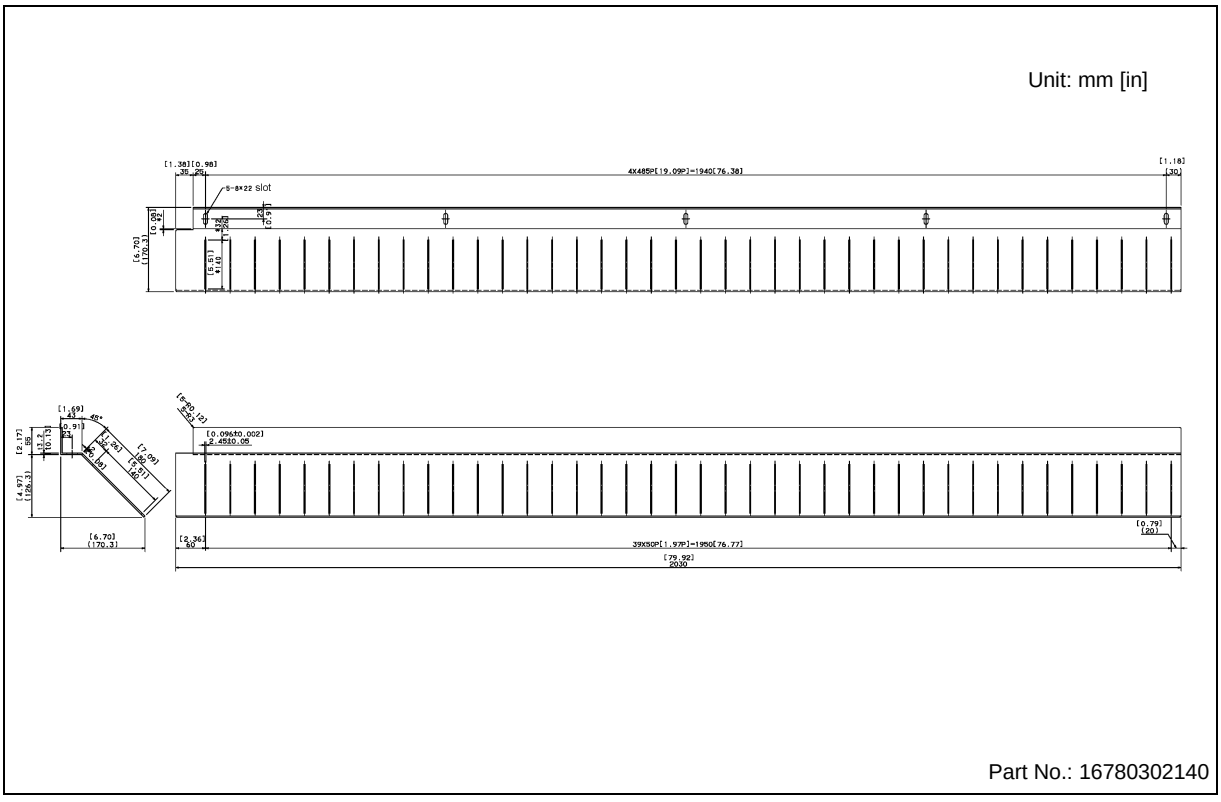

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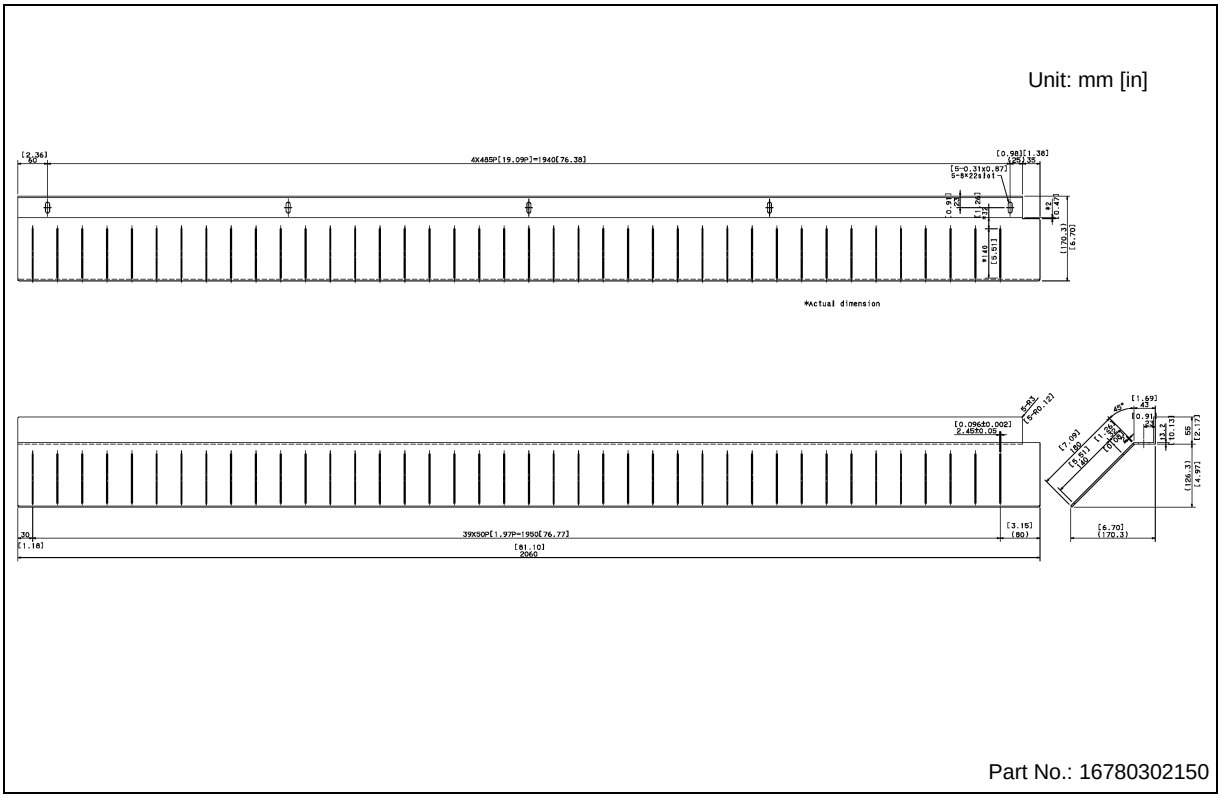

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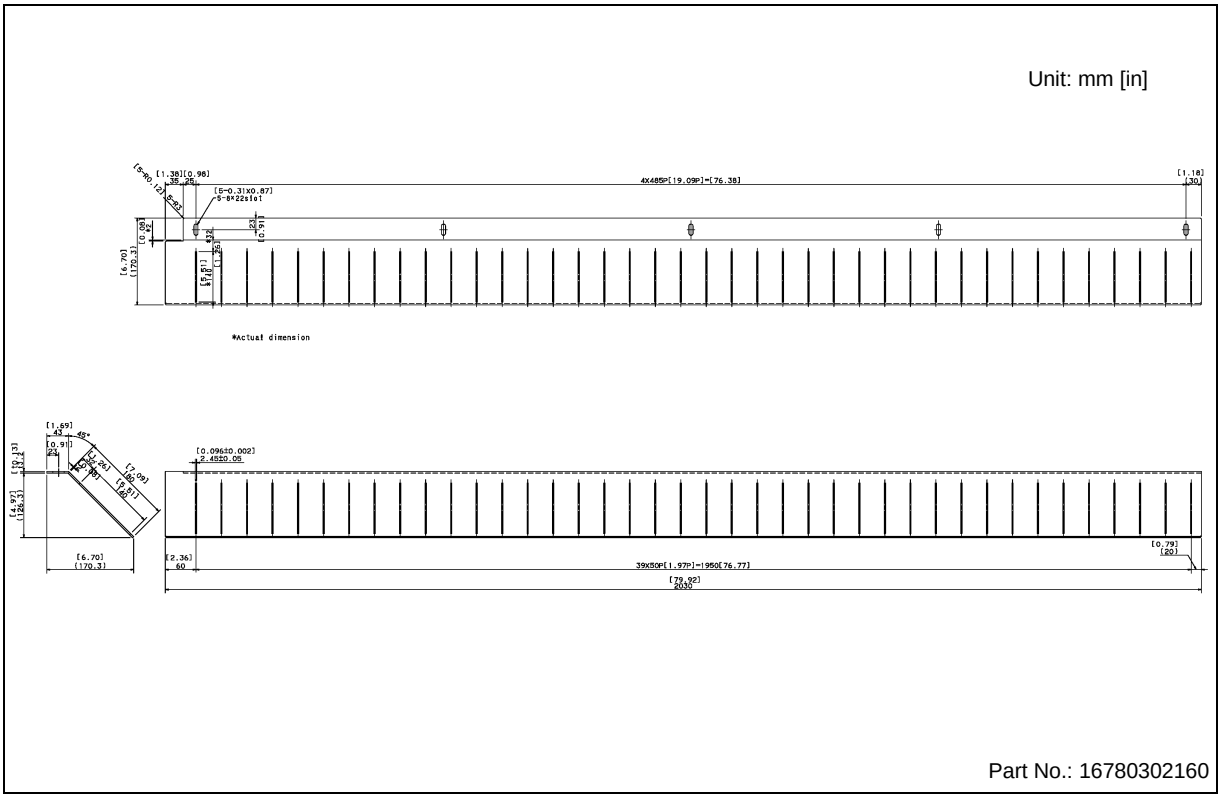
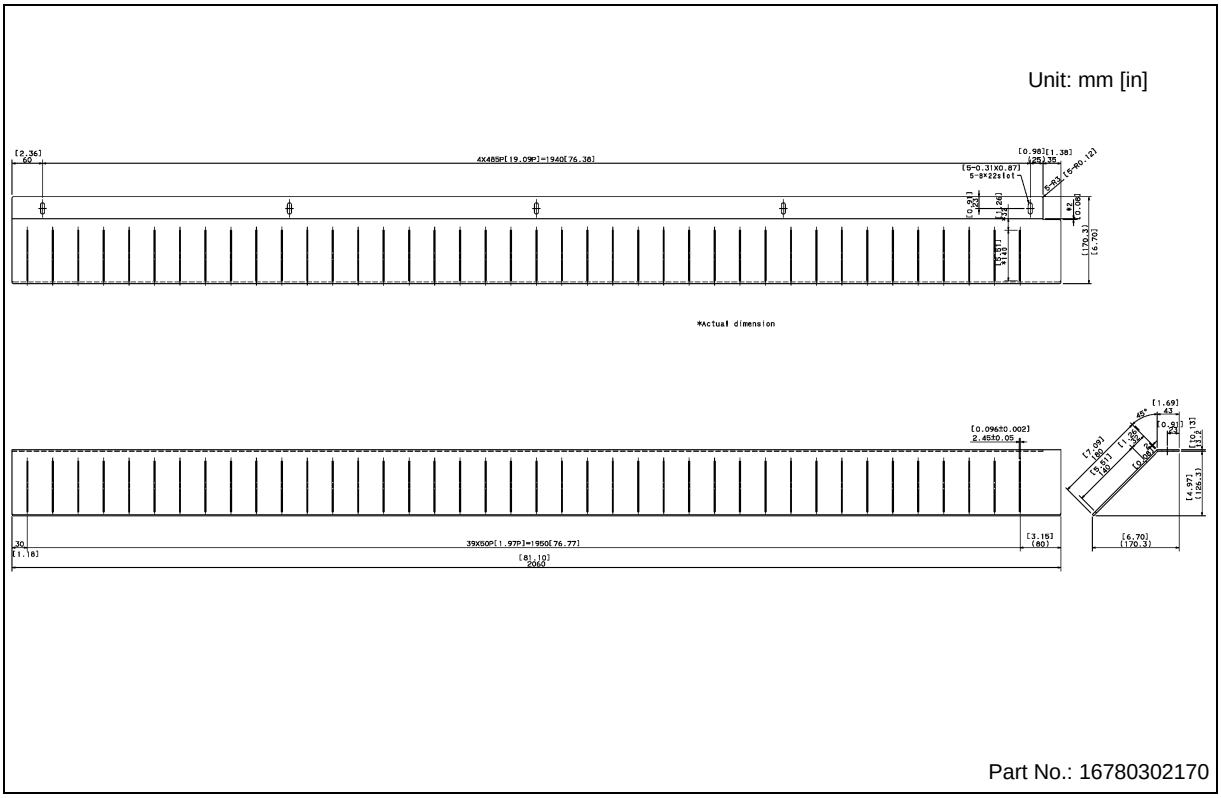


Fig. 4-111 Bracket (No. 104)



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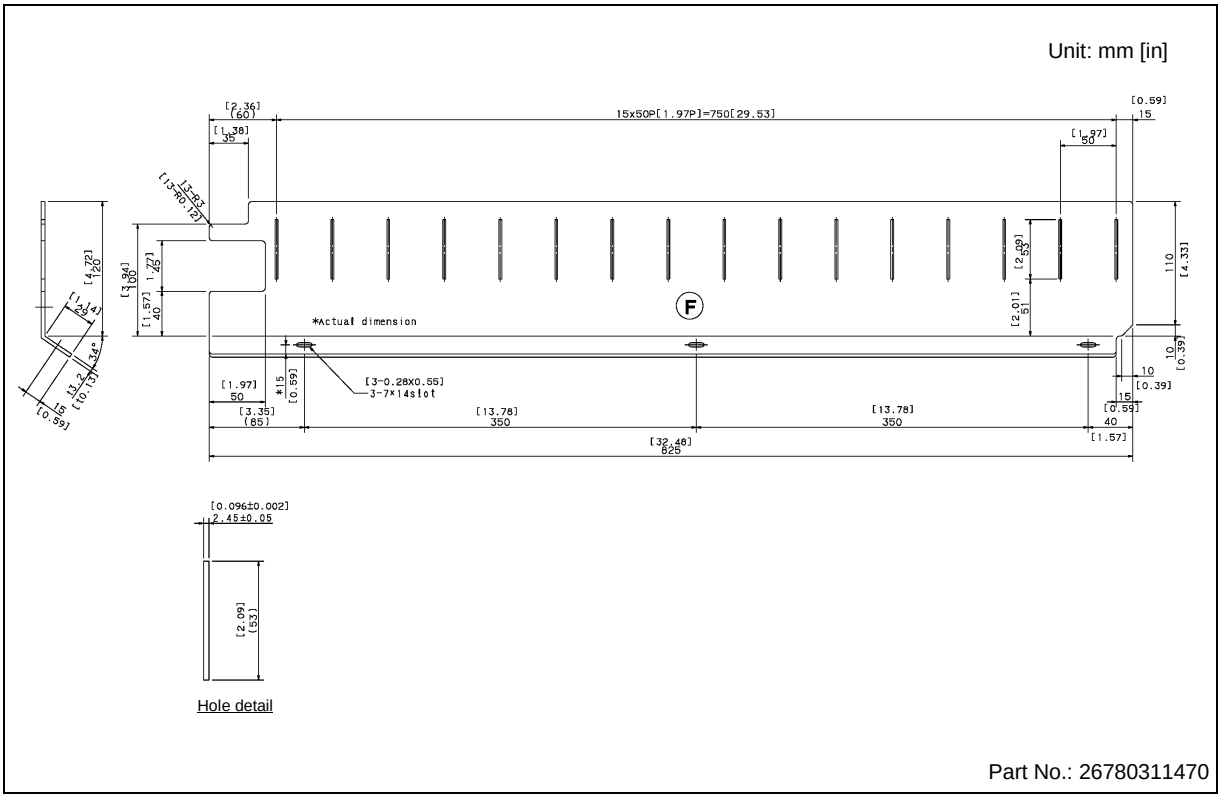

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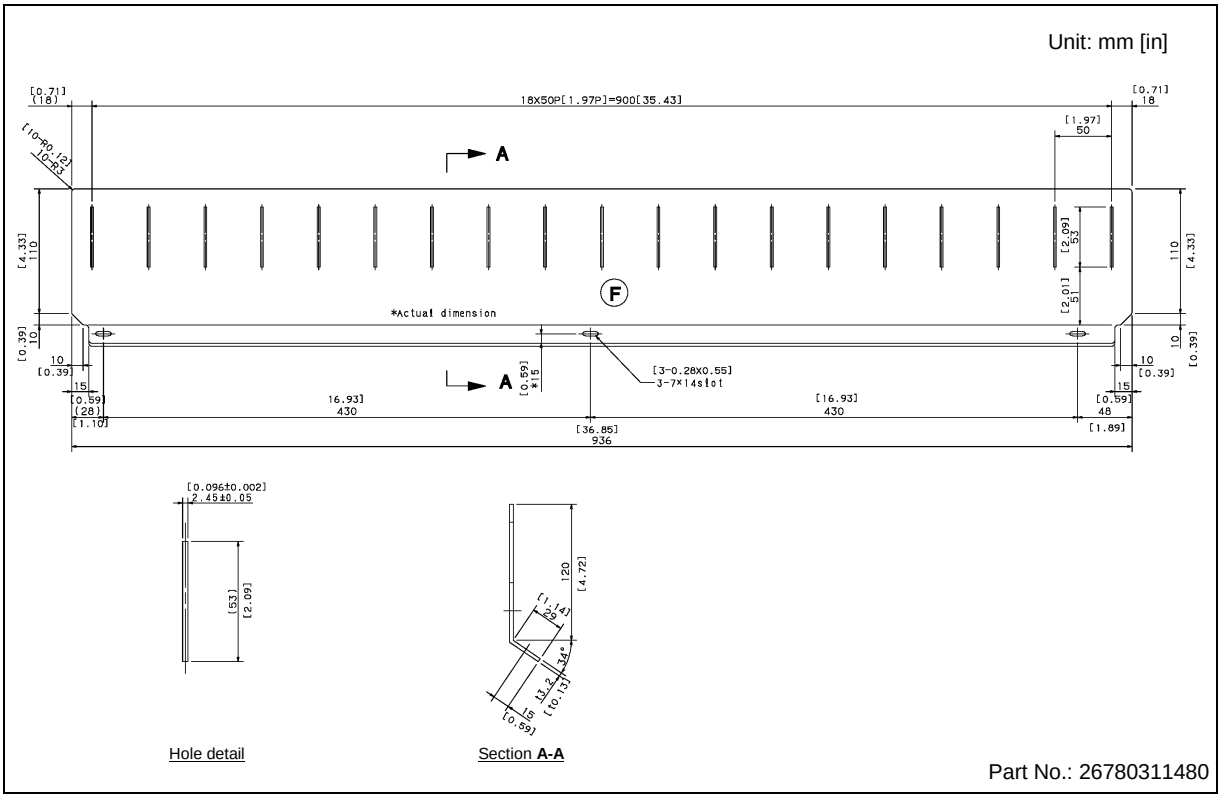


Fig. 4-114 Cover (No. 107)

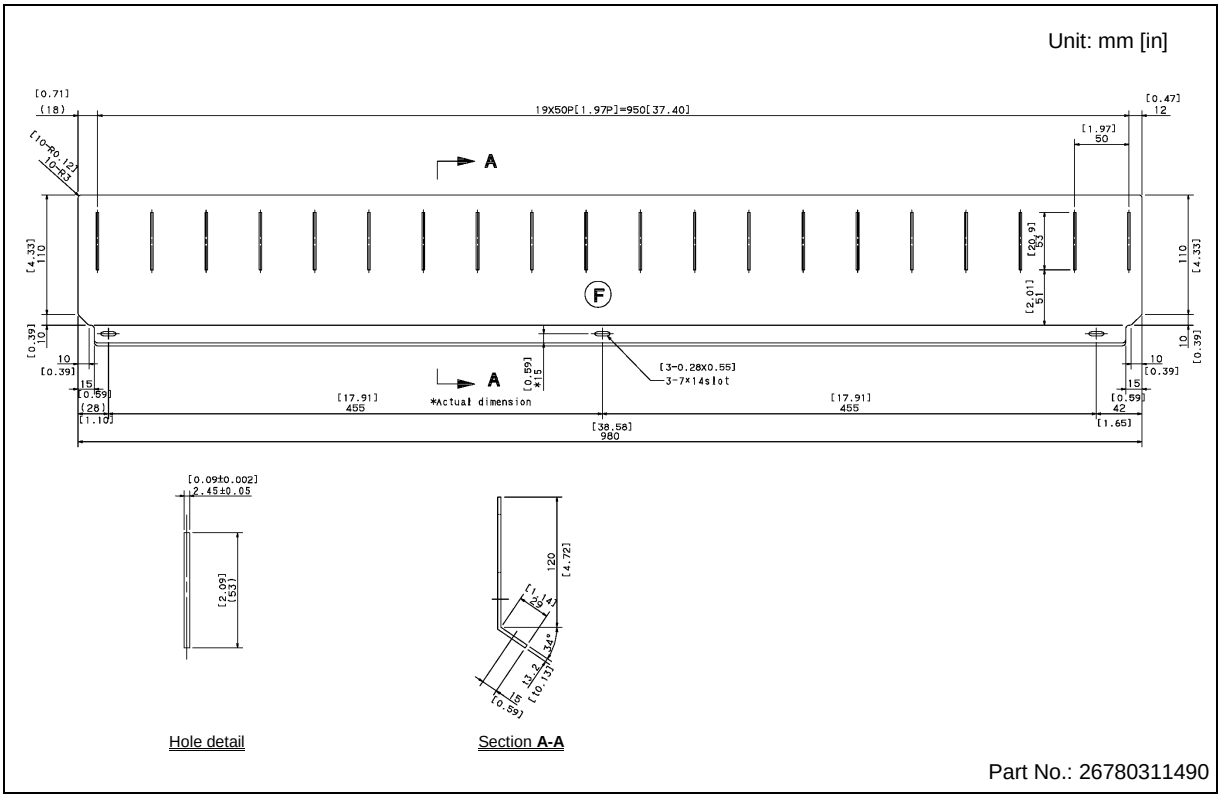


Fig. 4-115 Cover (No. 108)

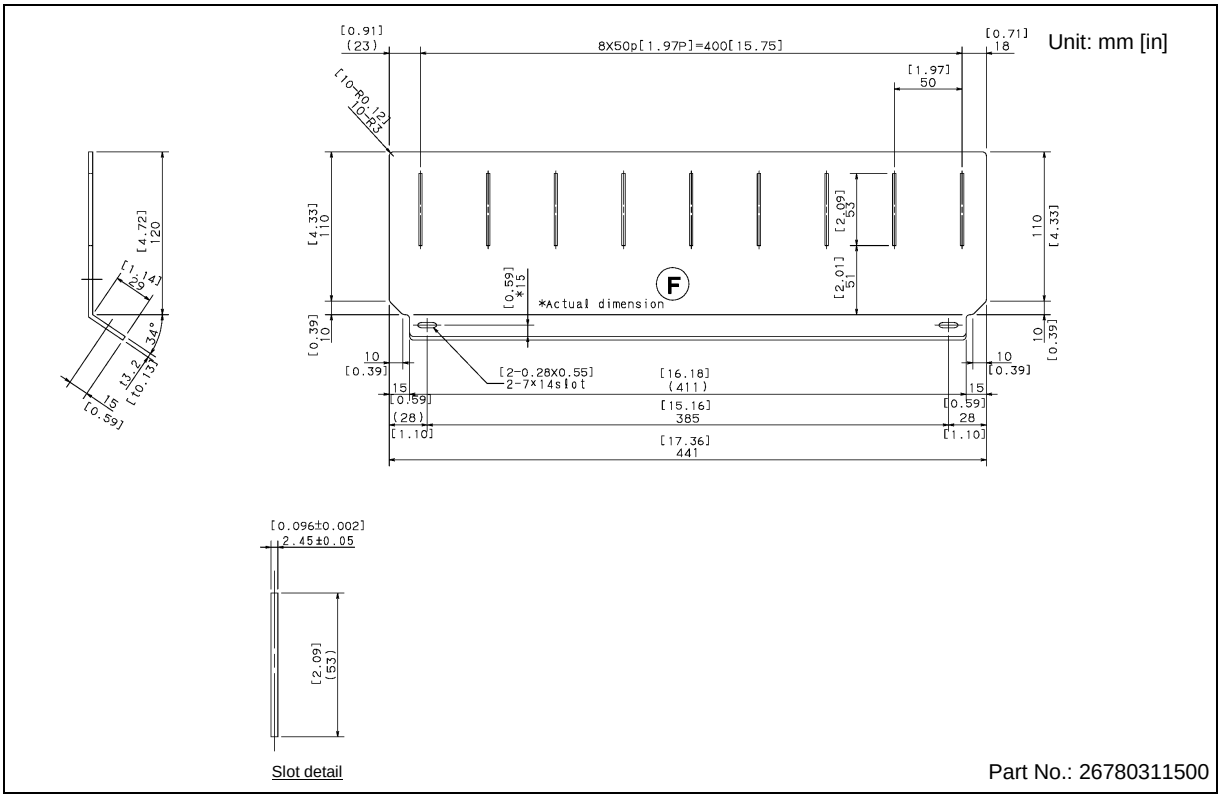
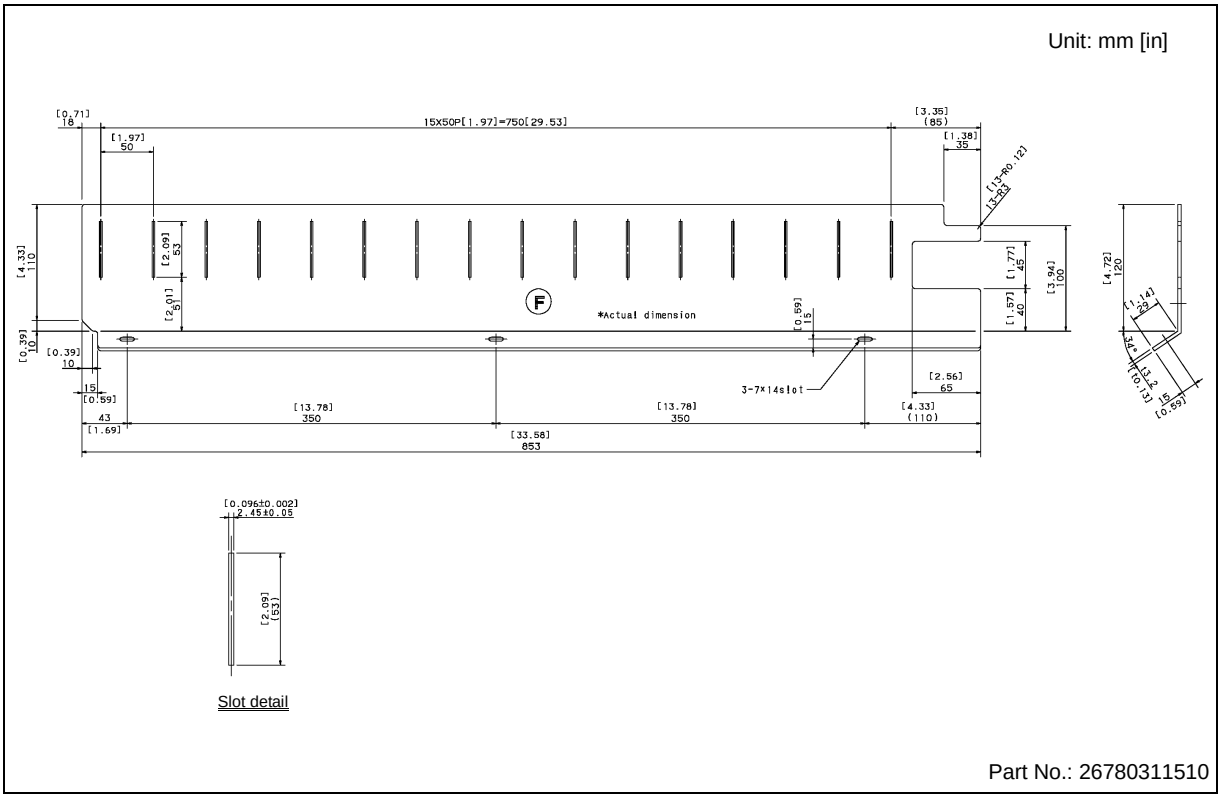


Fig. 4-116 Cover (No. 109)



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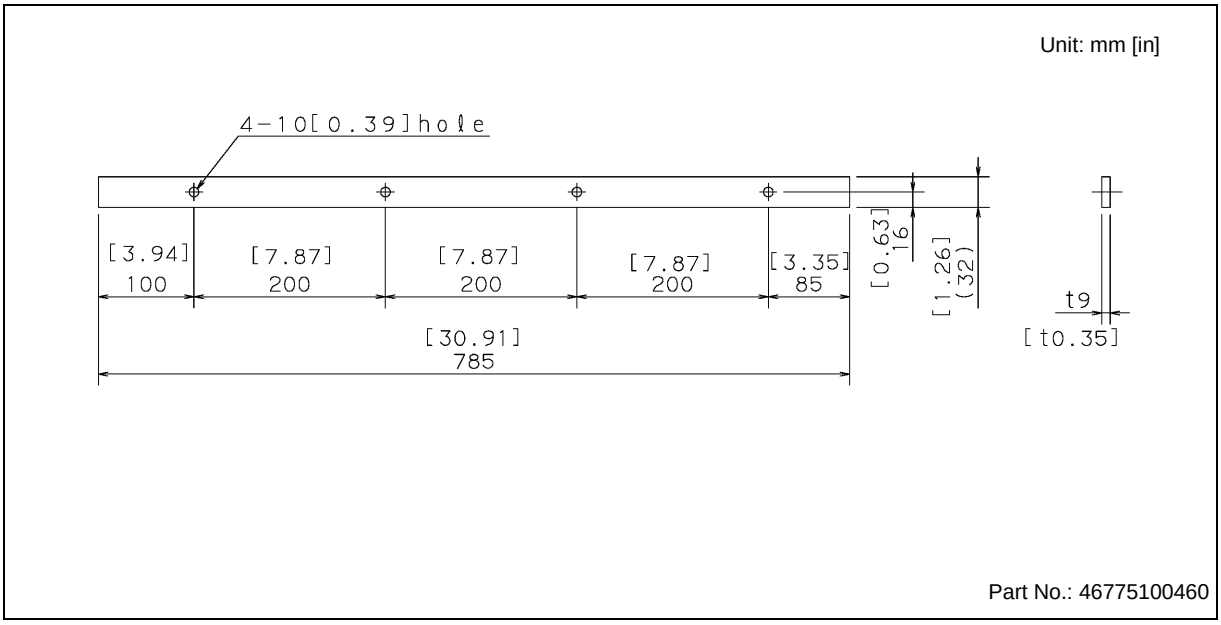

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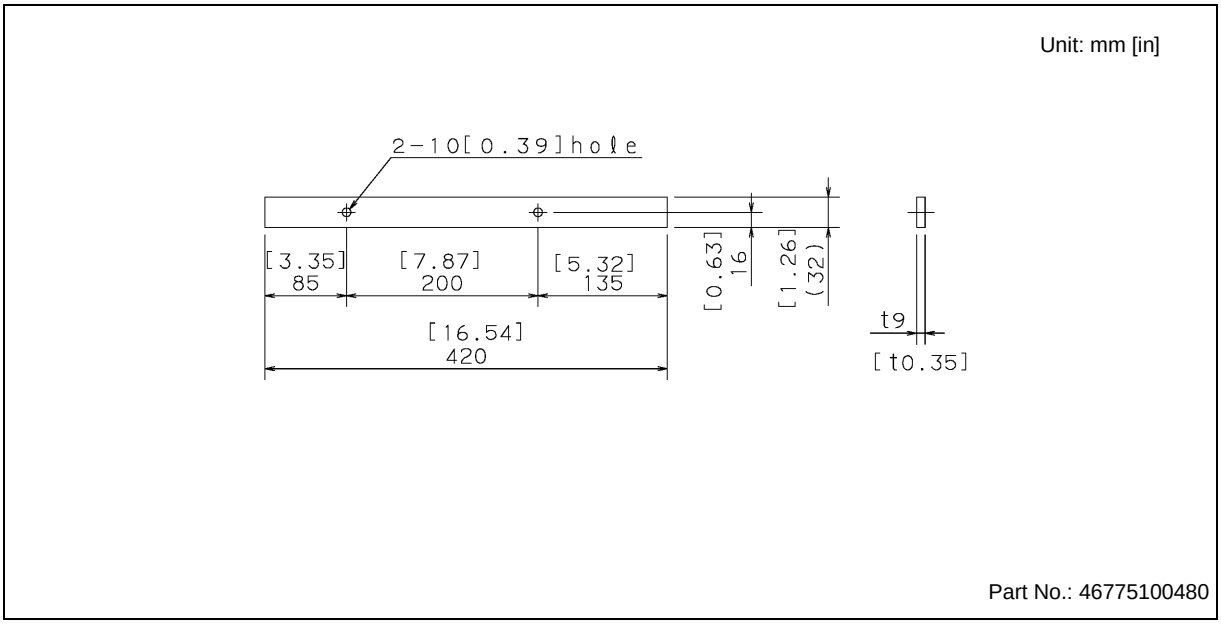

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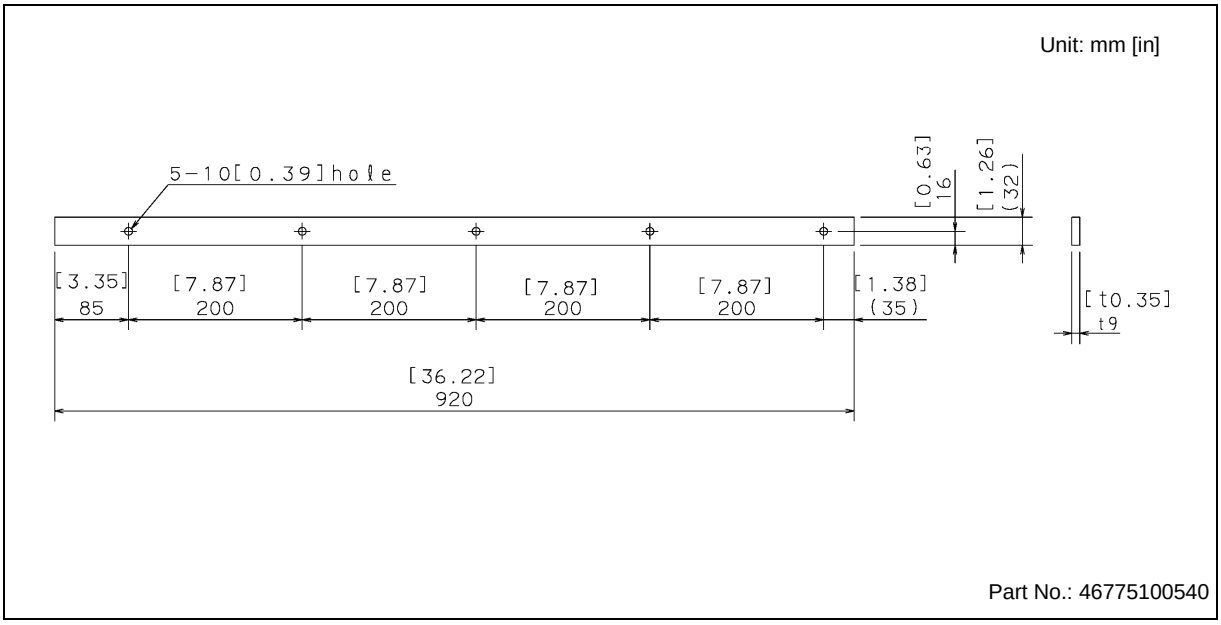

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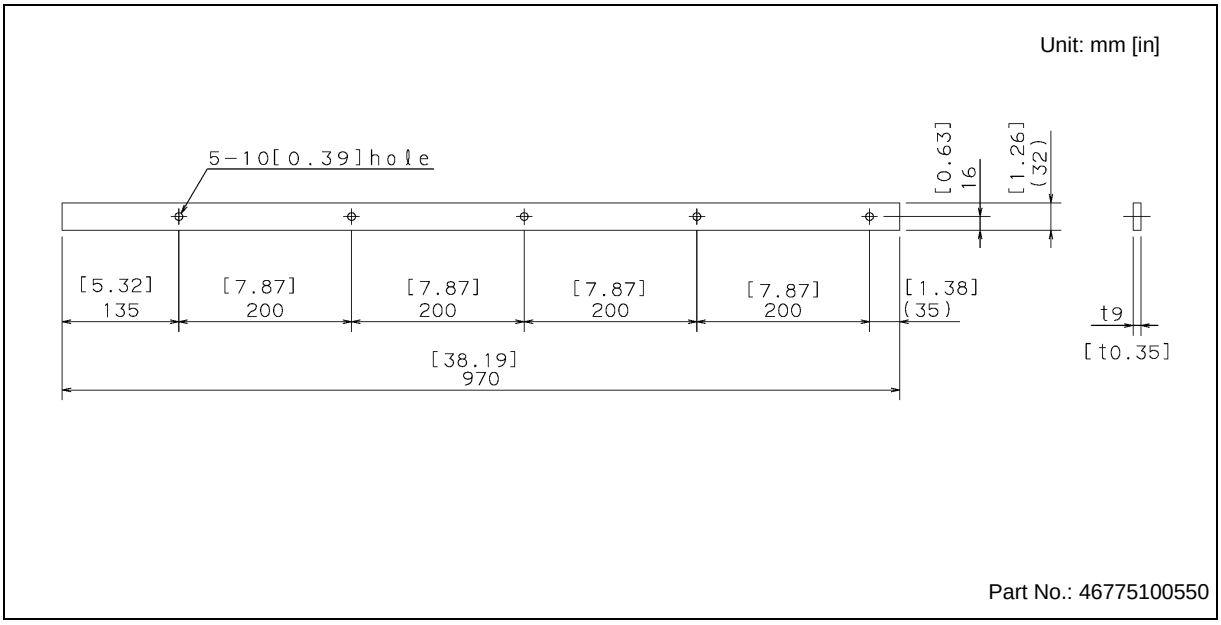

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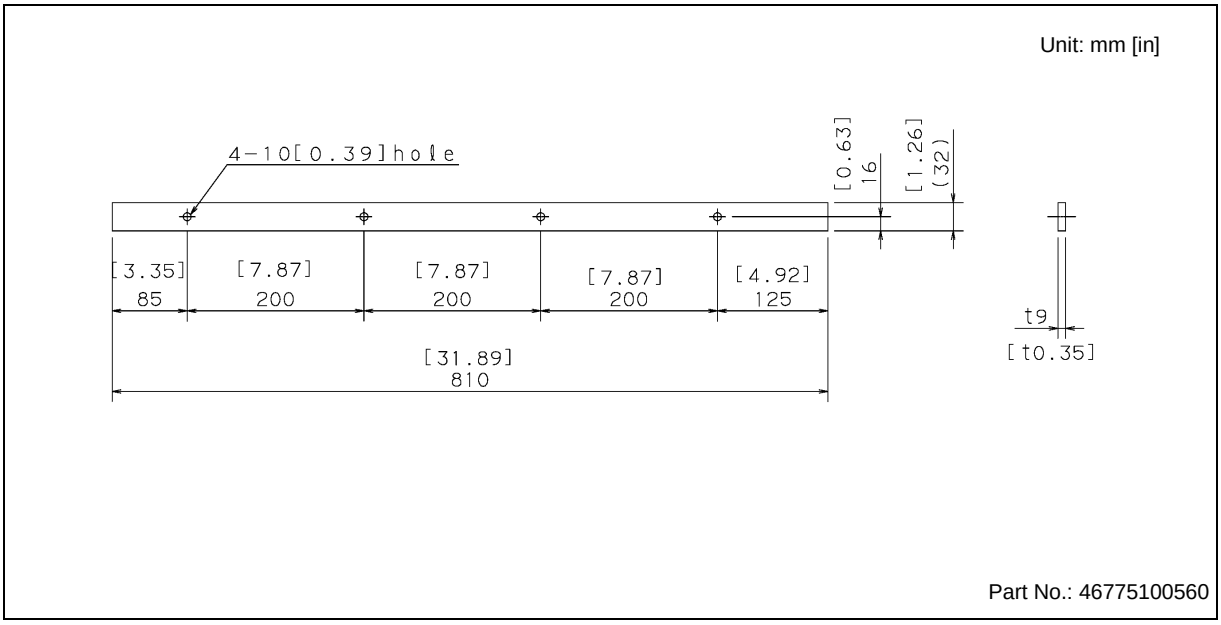

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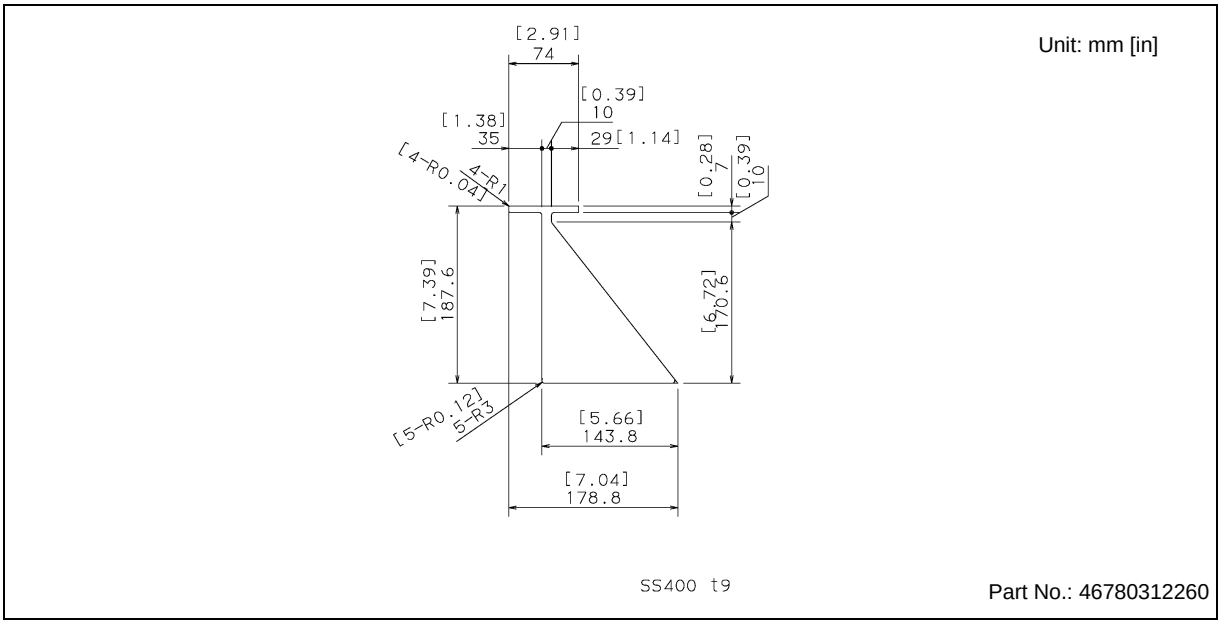


Fig. 4-123 Plate (No. 116)

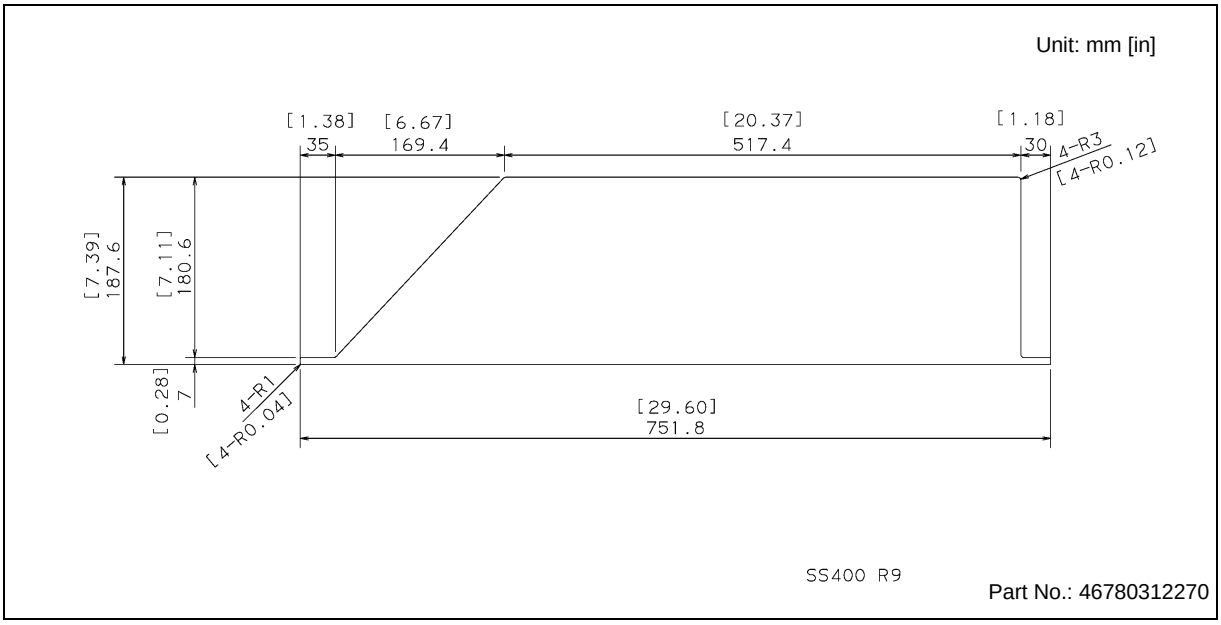


Fig. 4-124 Plate (No. 117)

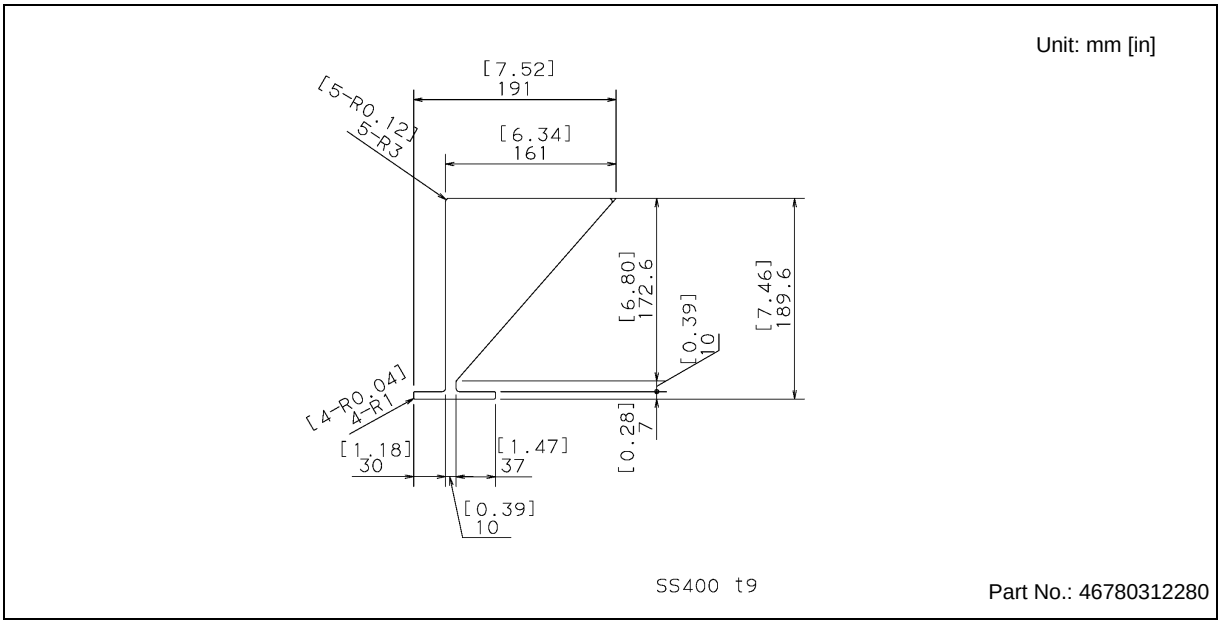


Fig. 4-125 Plate (No. 118)

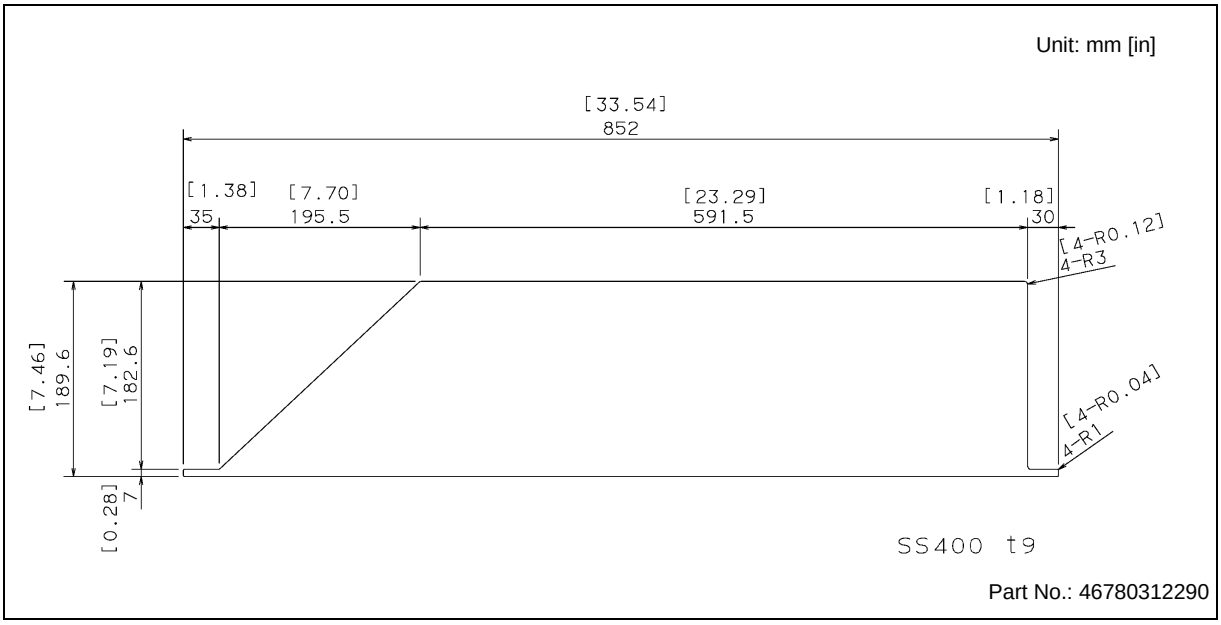


Fig. 4-126 Plate (No. 119)

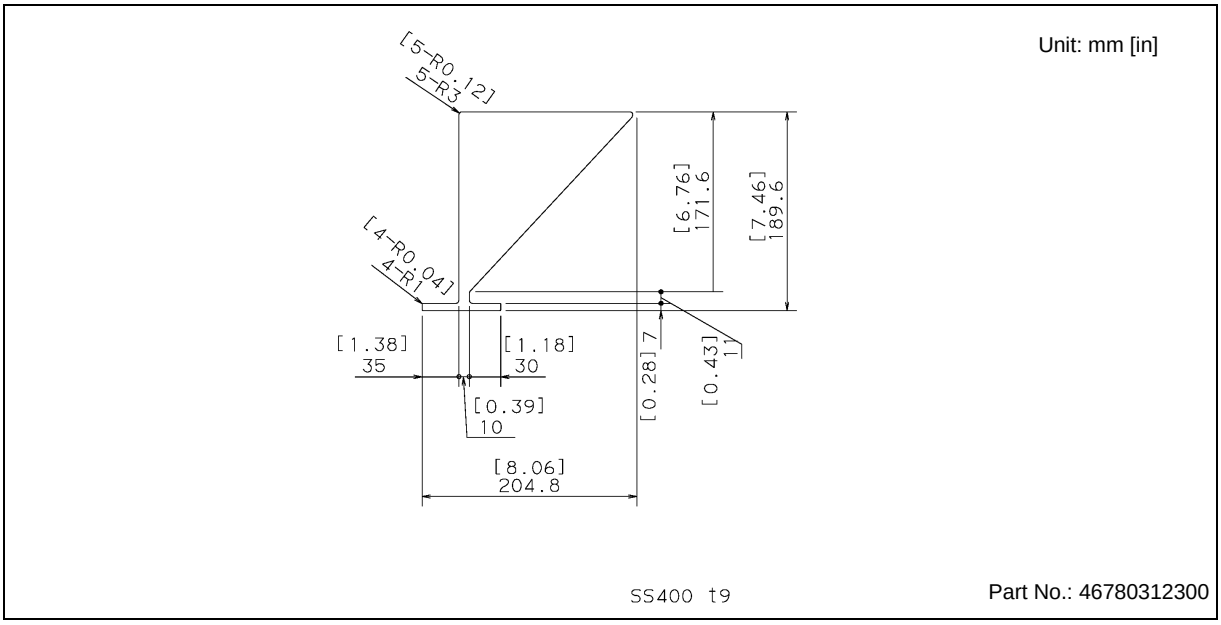


Fig. 4-127 Plate (No. 120)

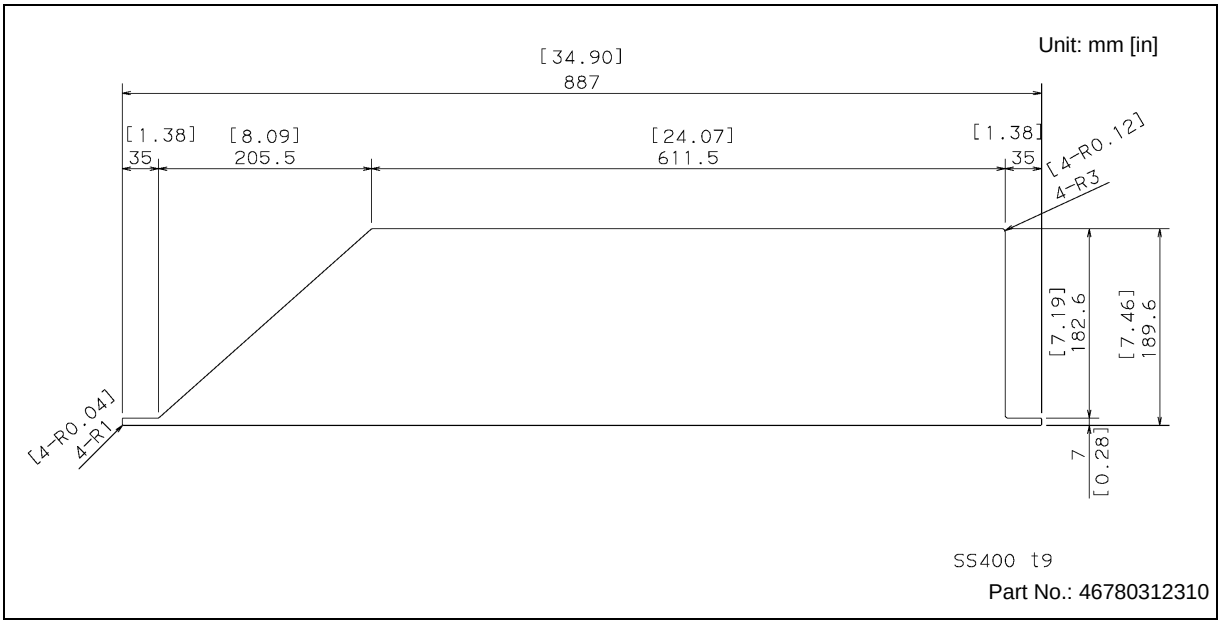
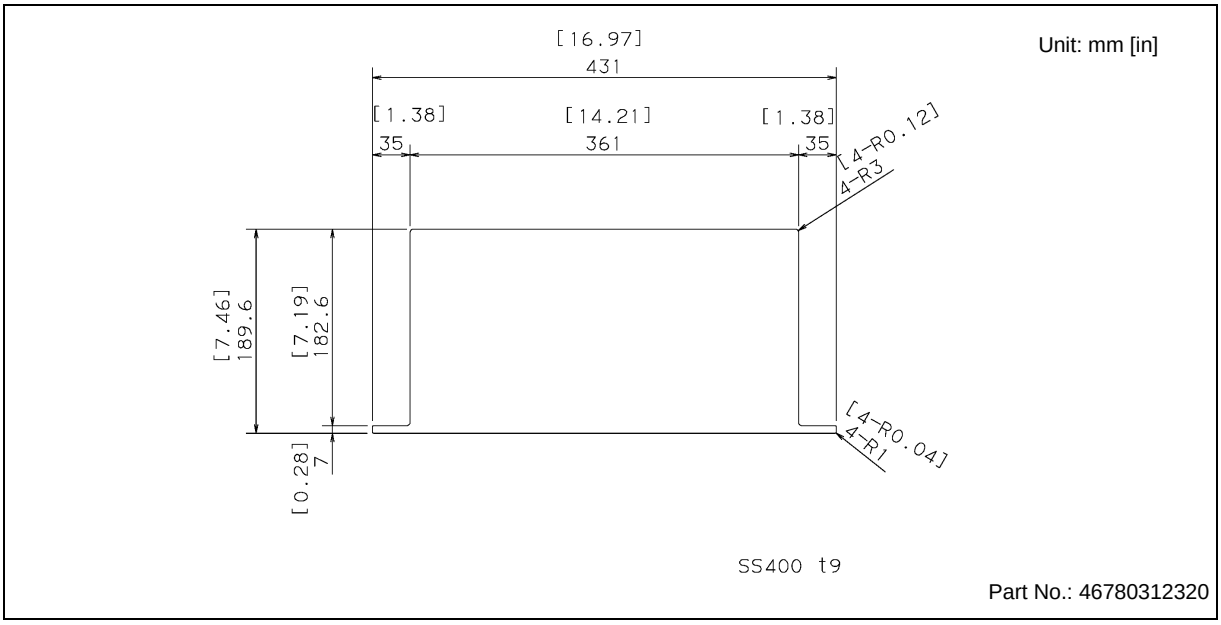


Fig. 4-128 Plate (No. 121)



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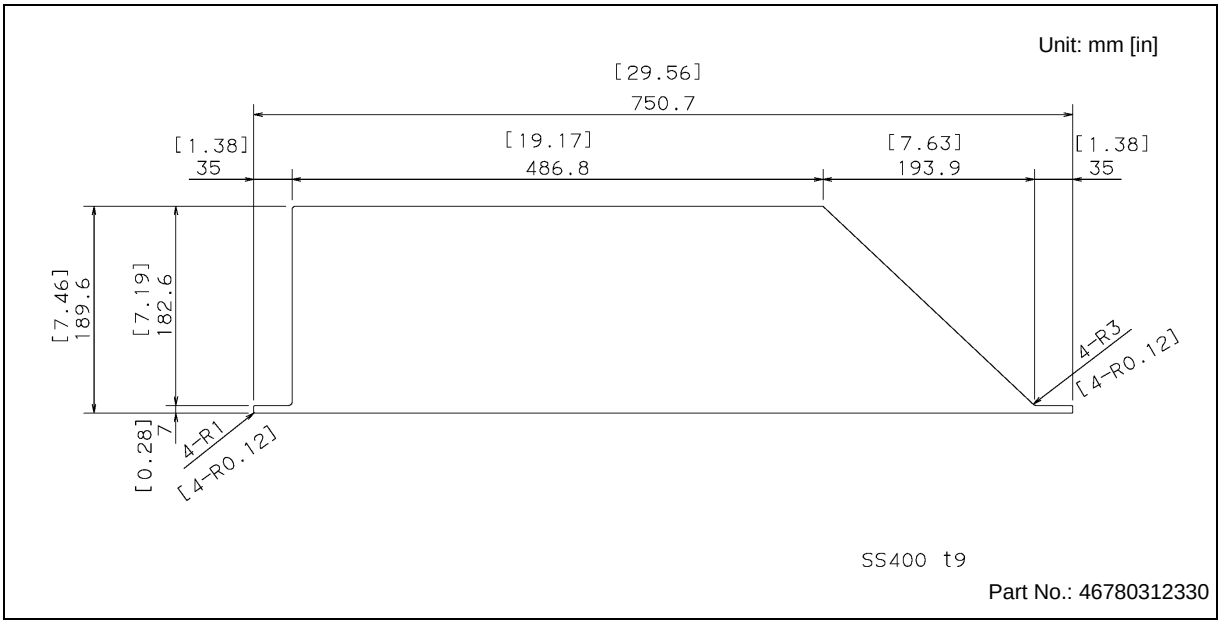

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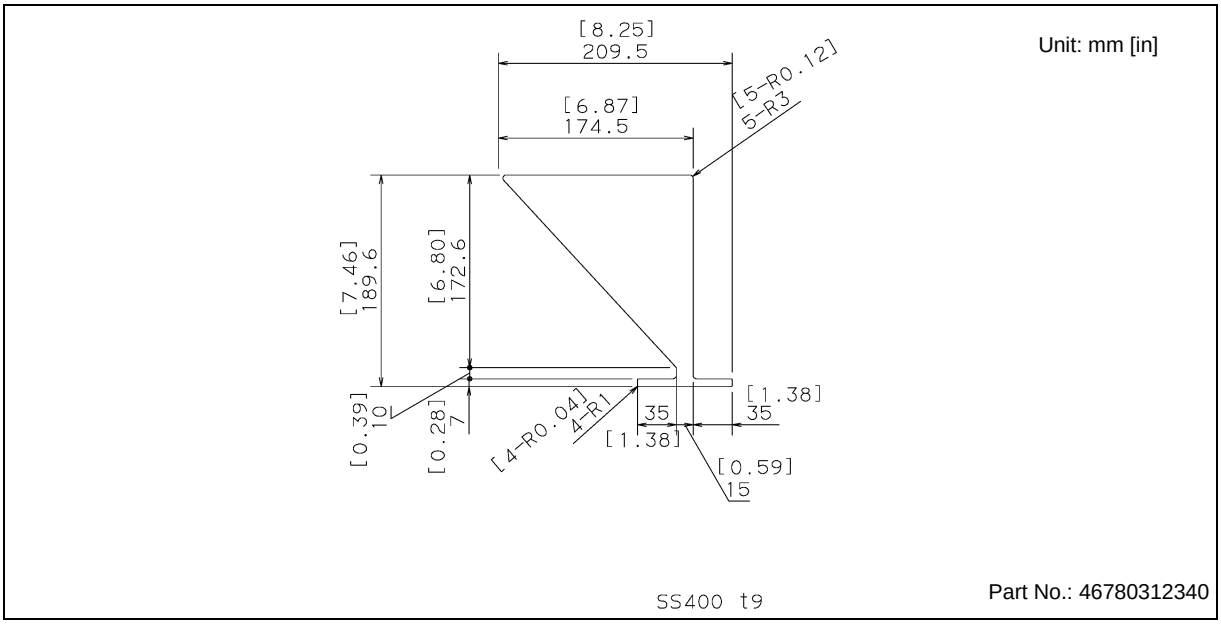


Fig. 4-131 Plate (No. 124)

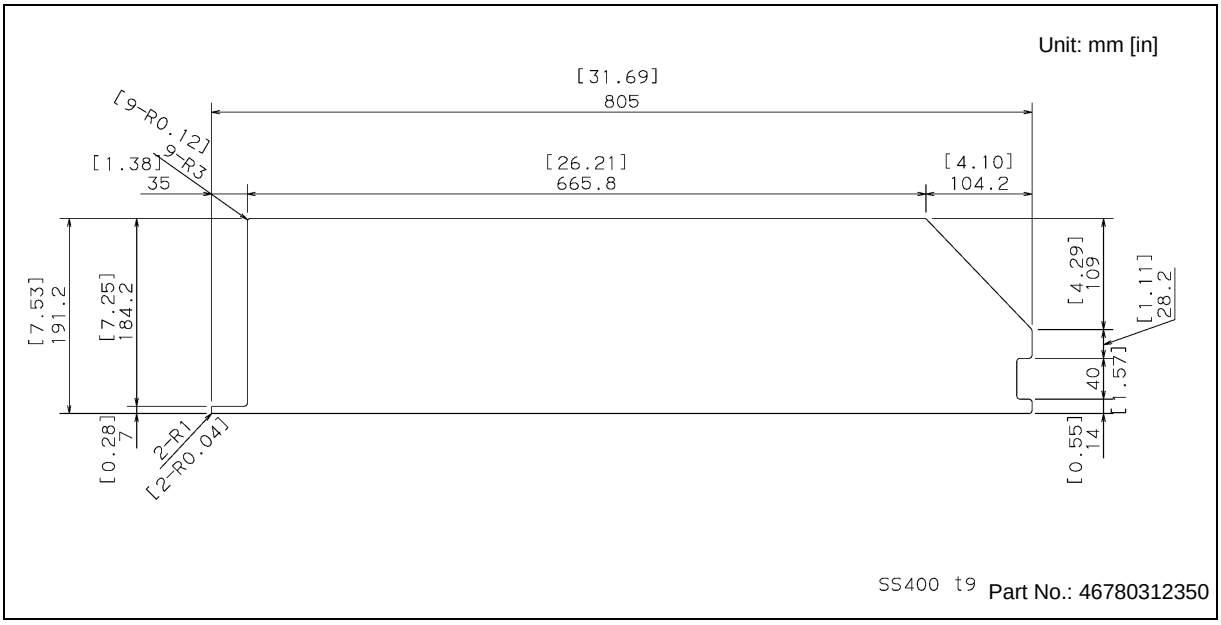
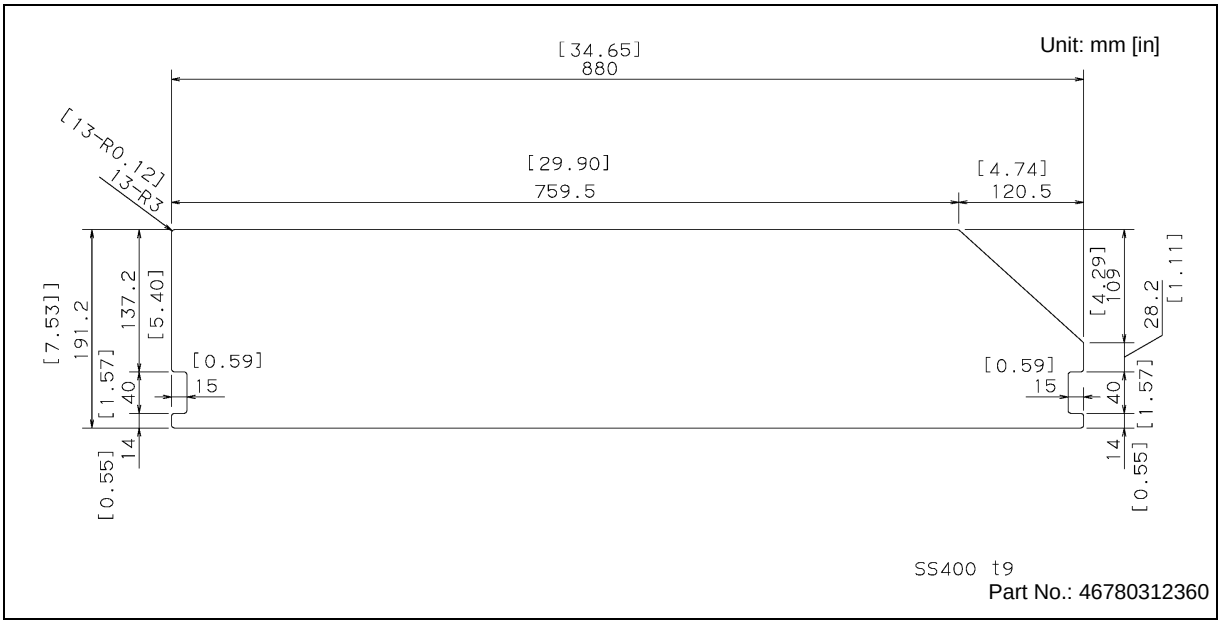


Fig. 4-132 Plate (No. 125)



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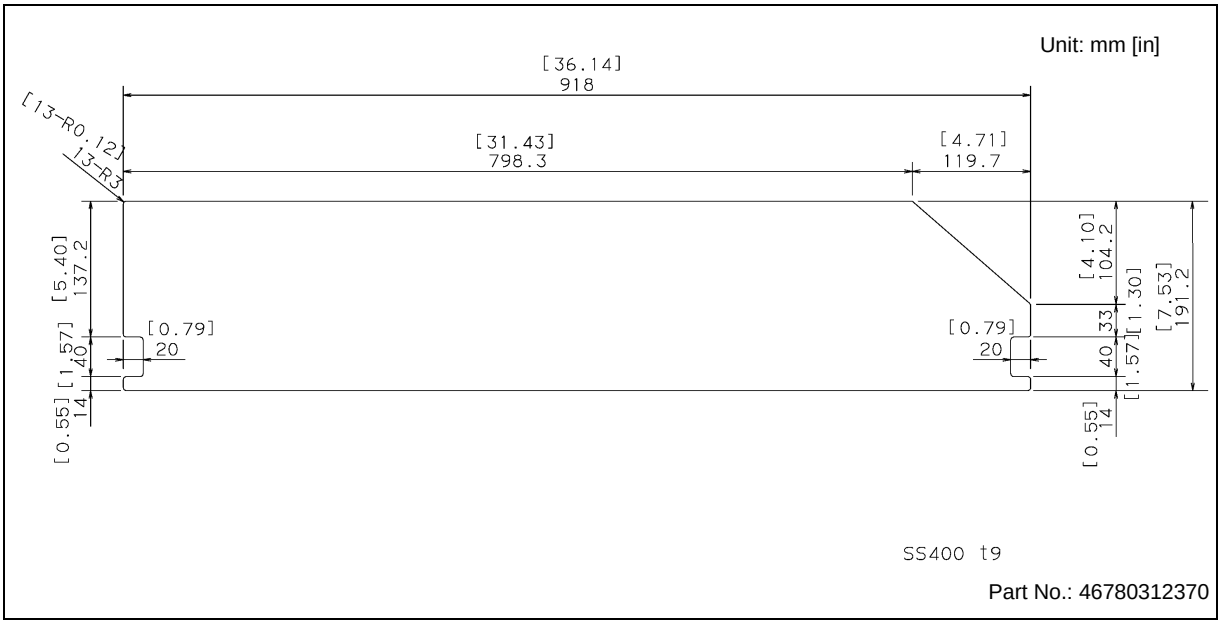

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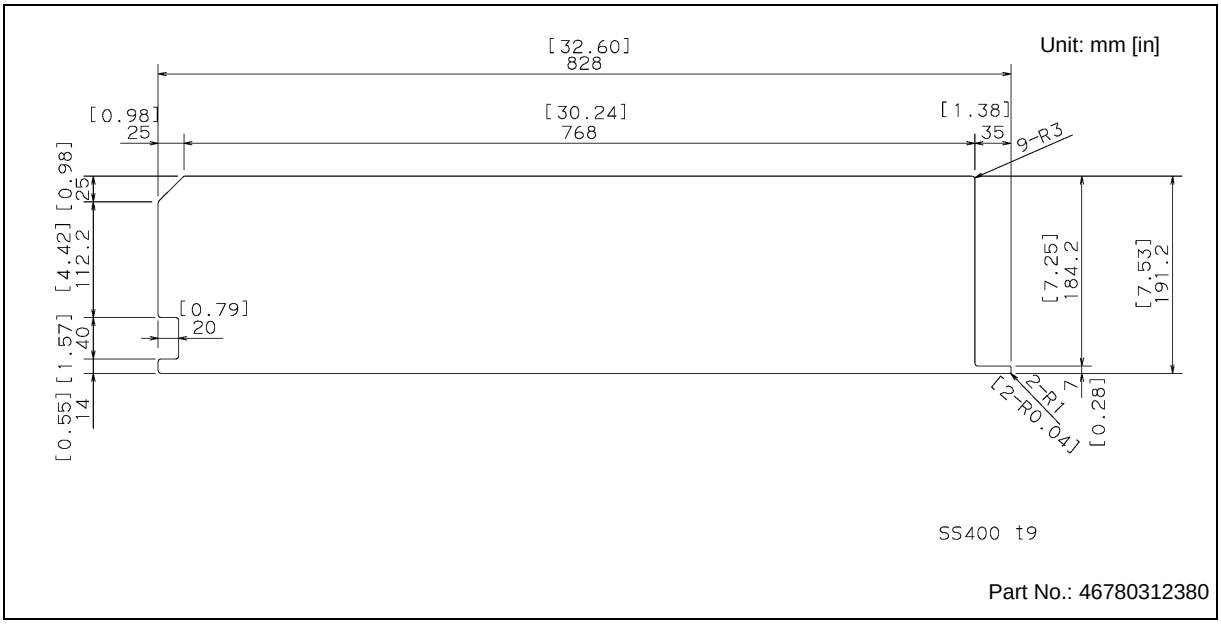

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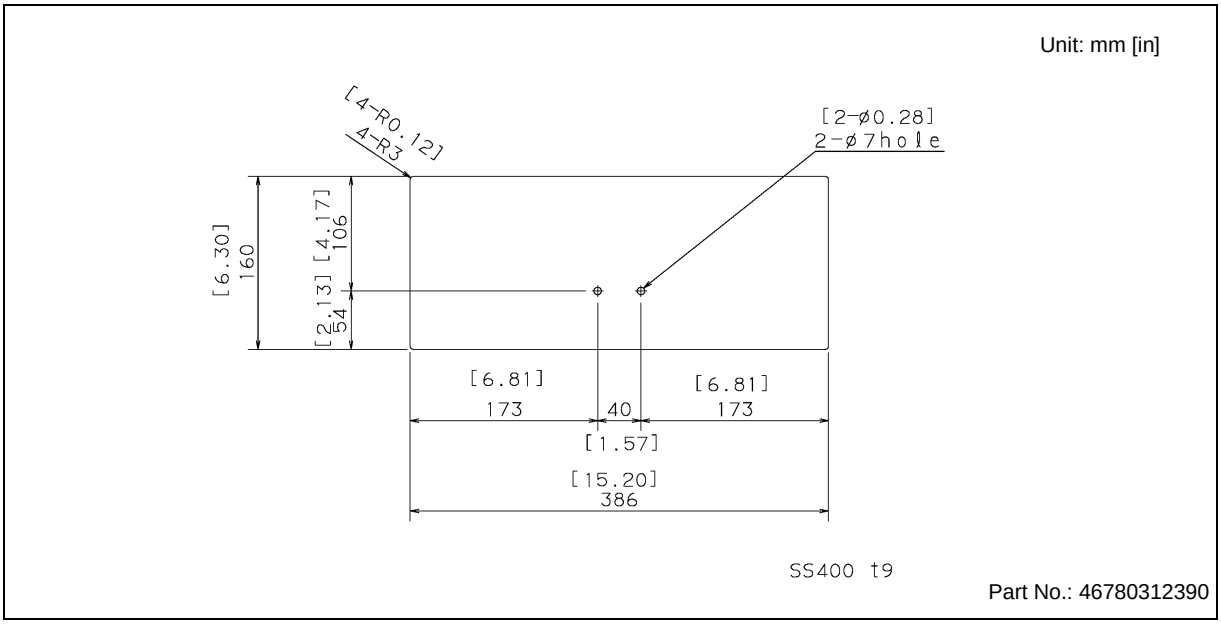

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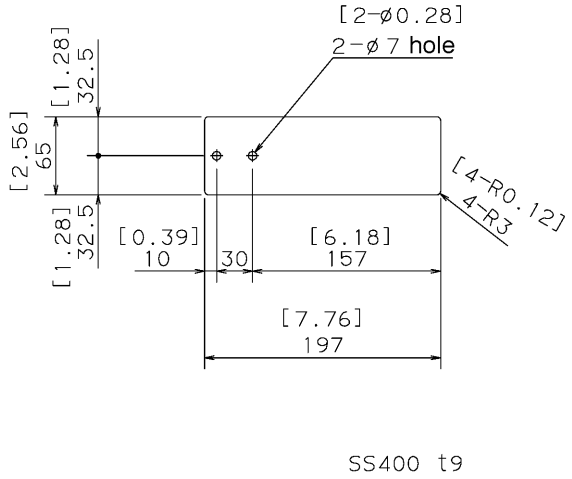
Unit: mm [in]



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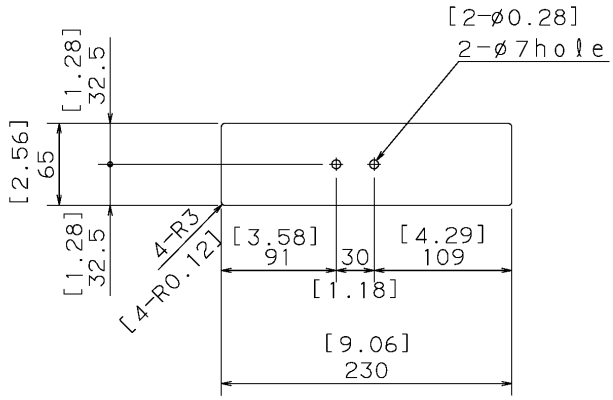

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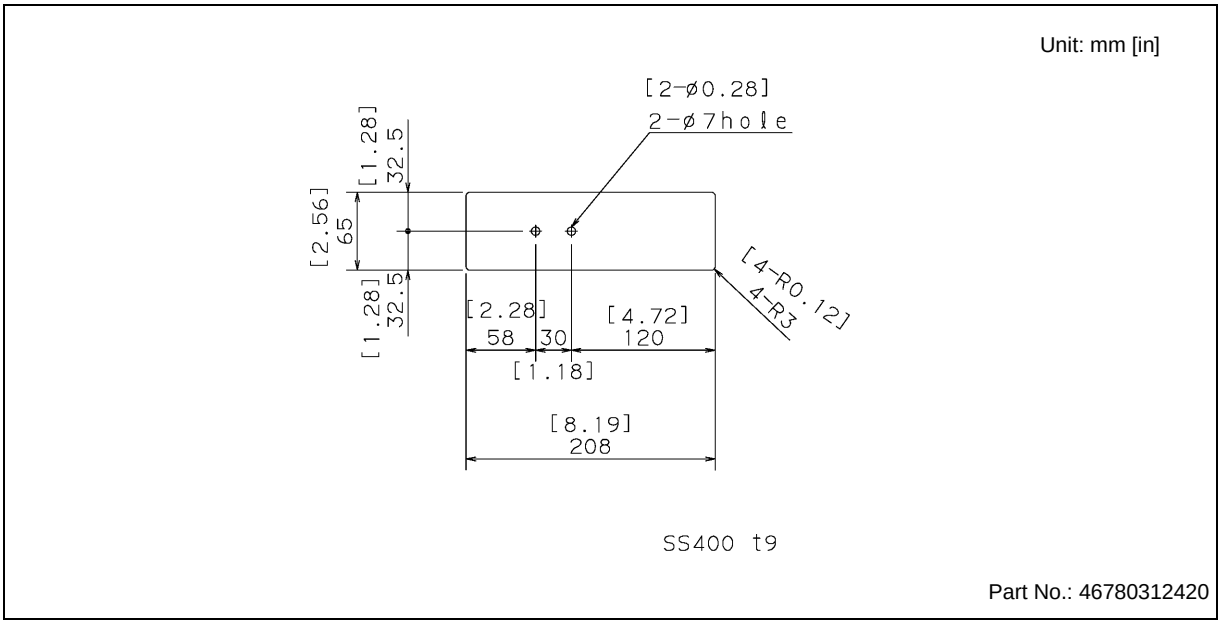

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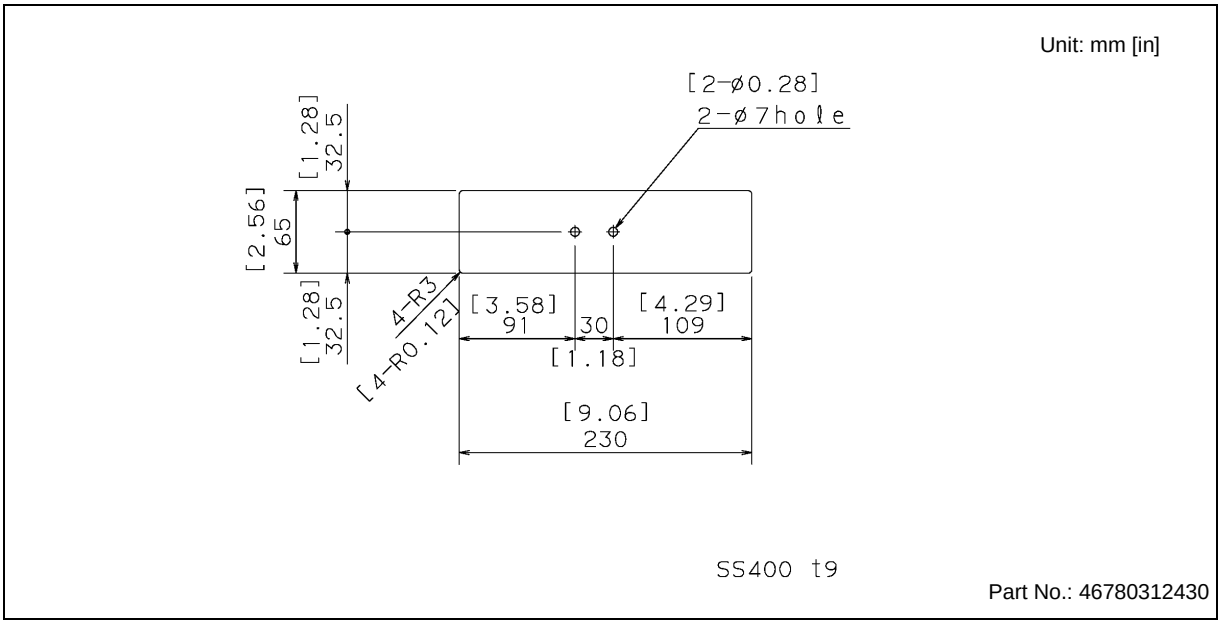

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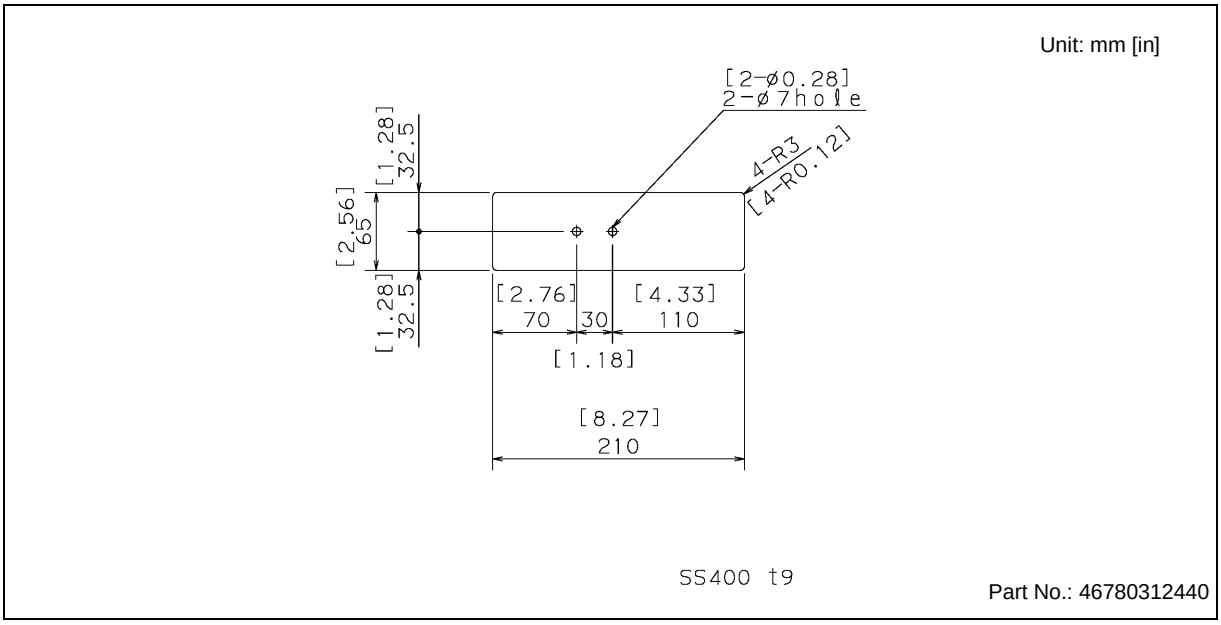

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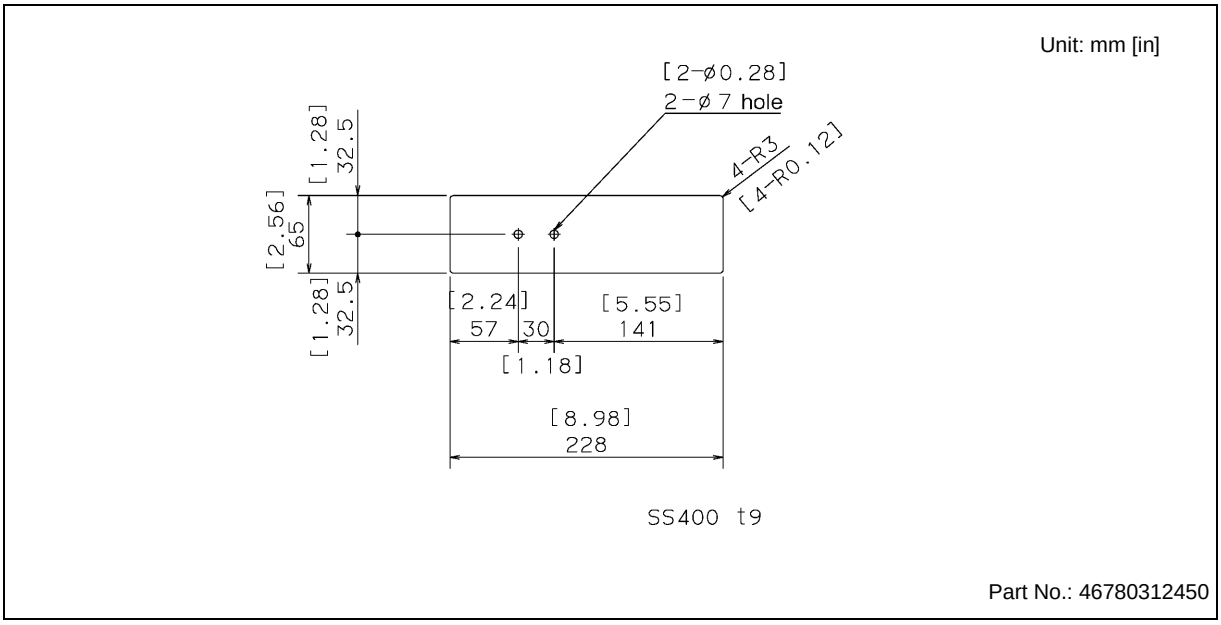

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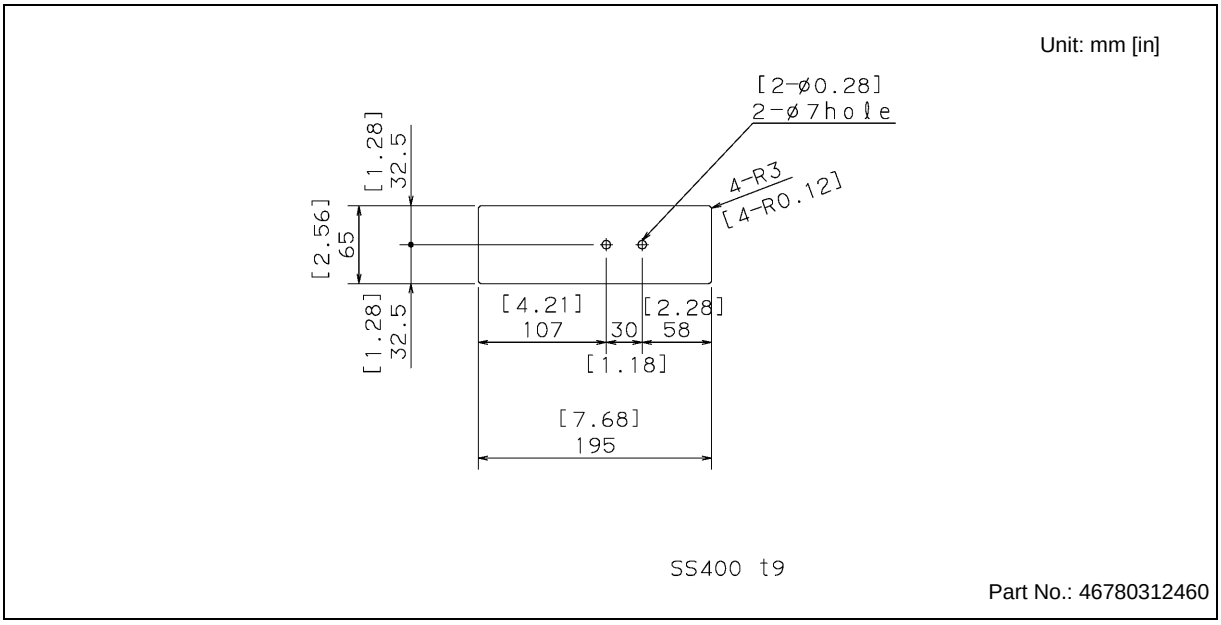

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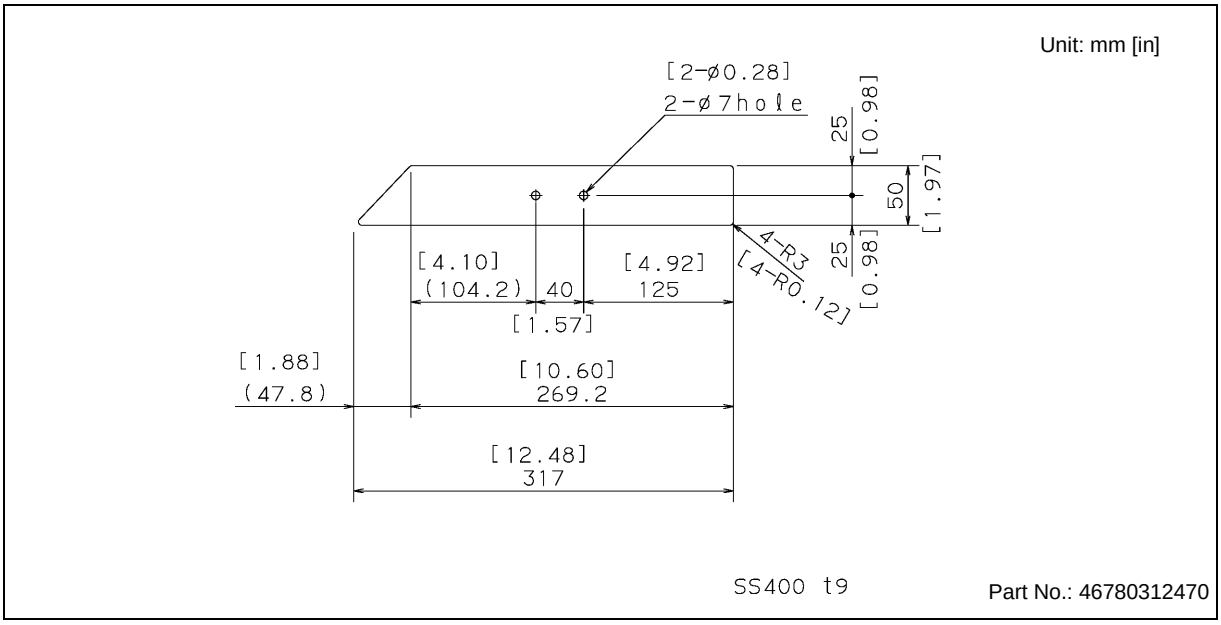

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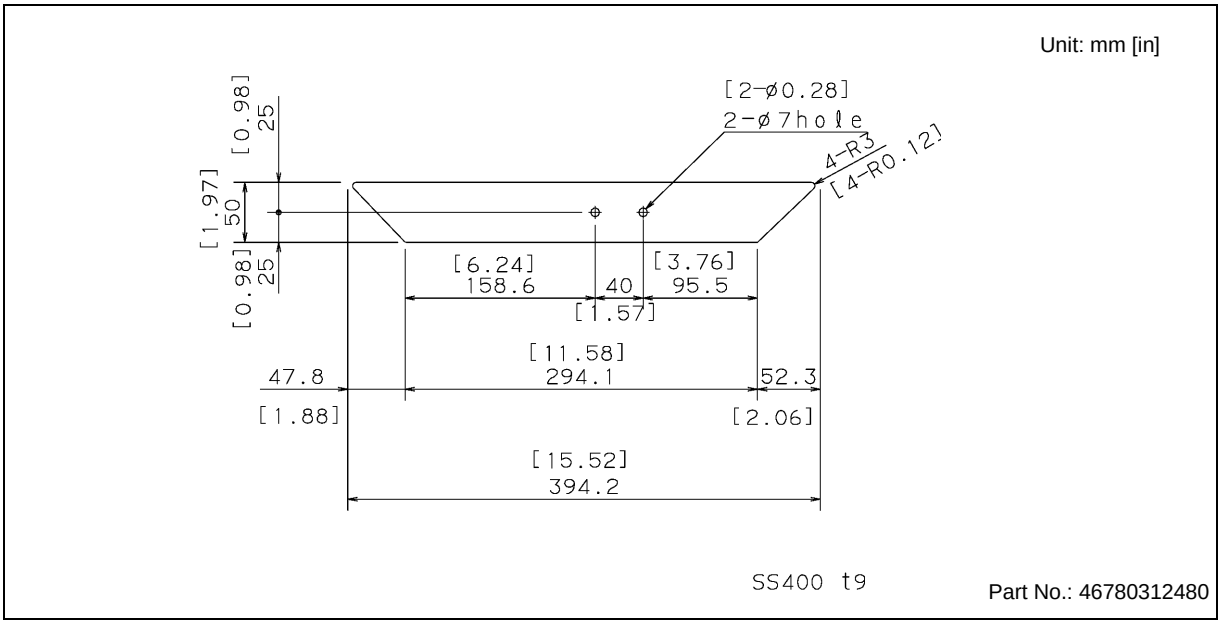

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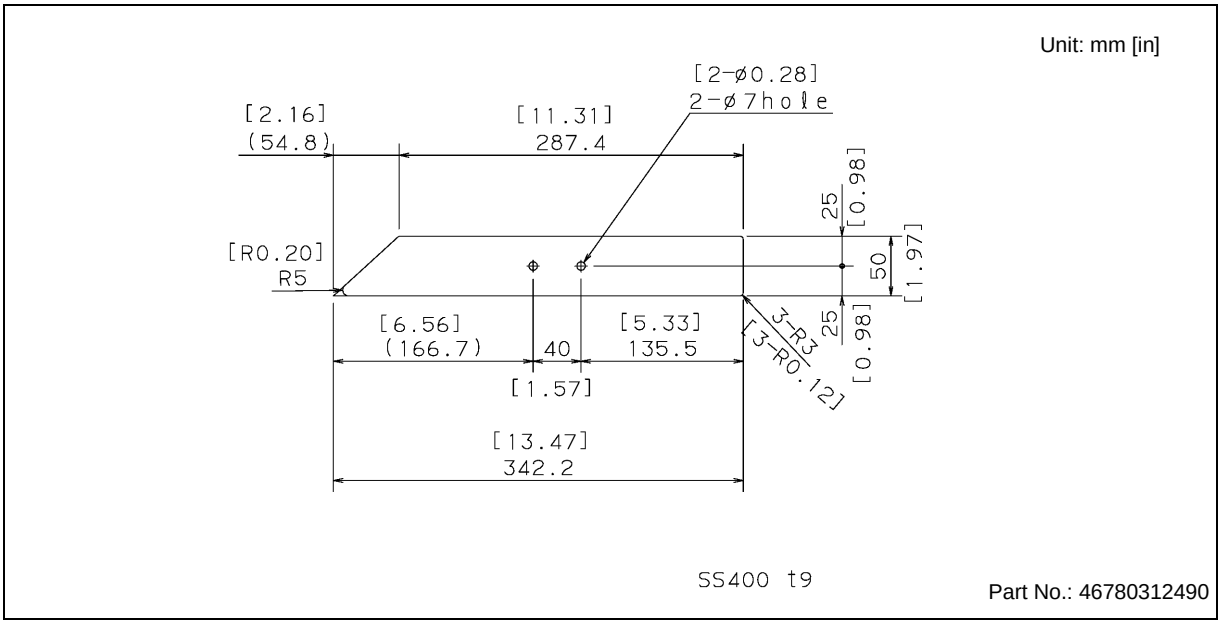

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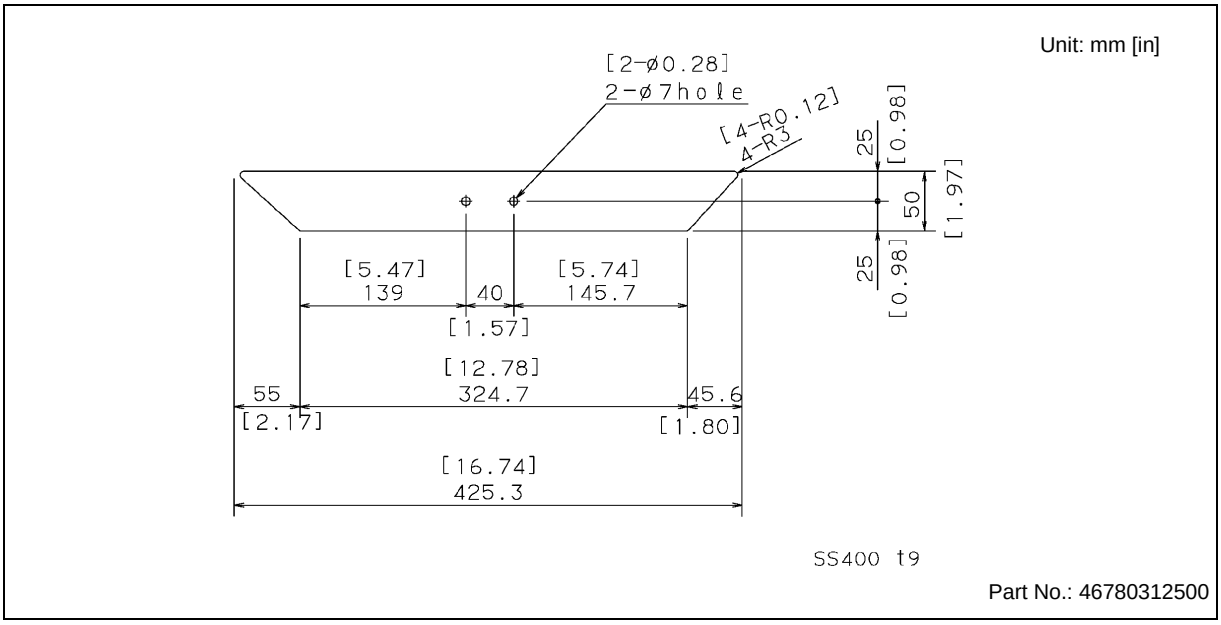

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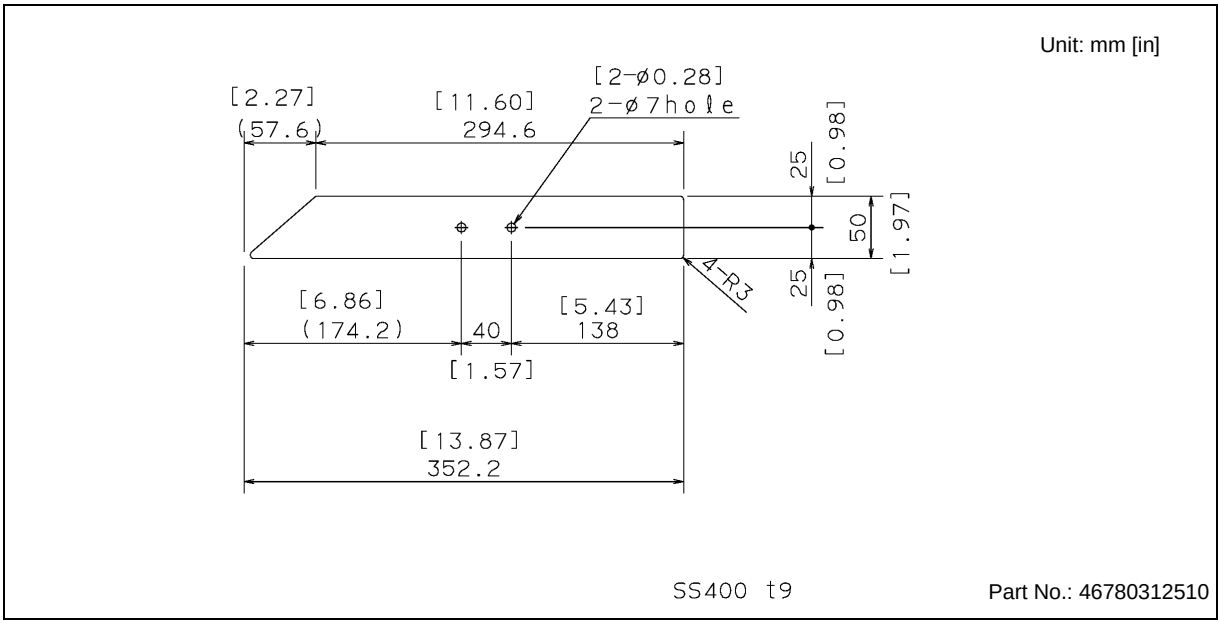

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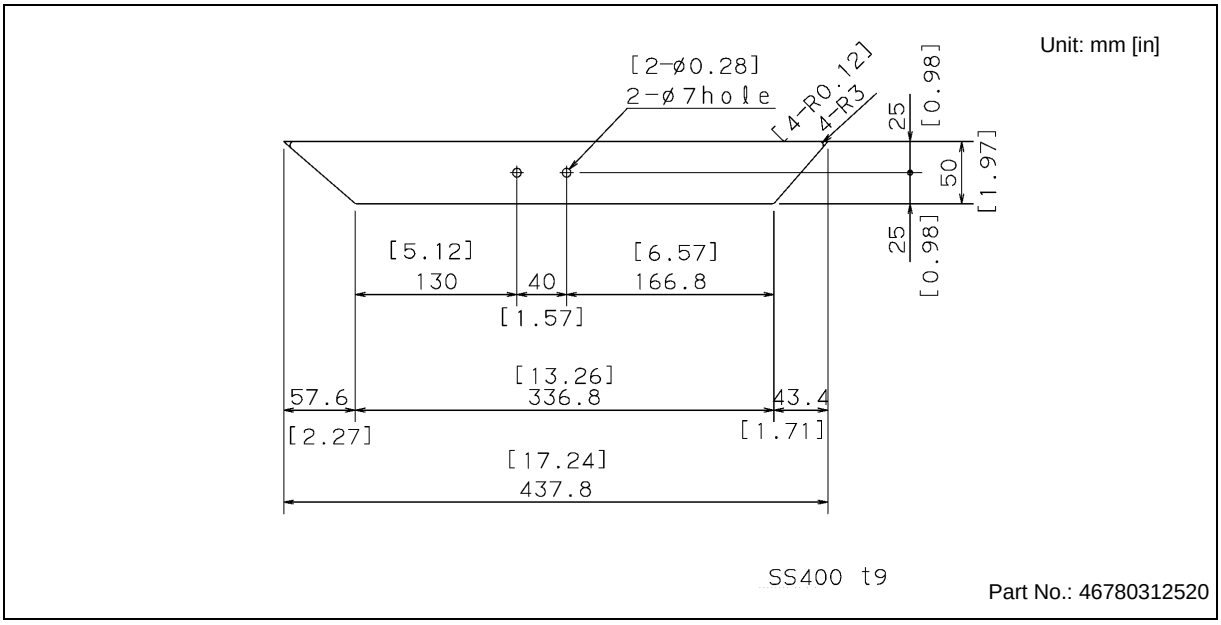

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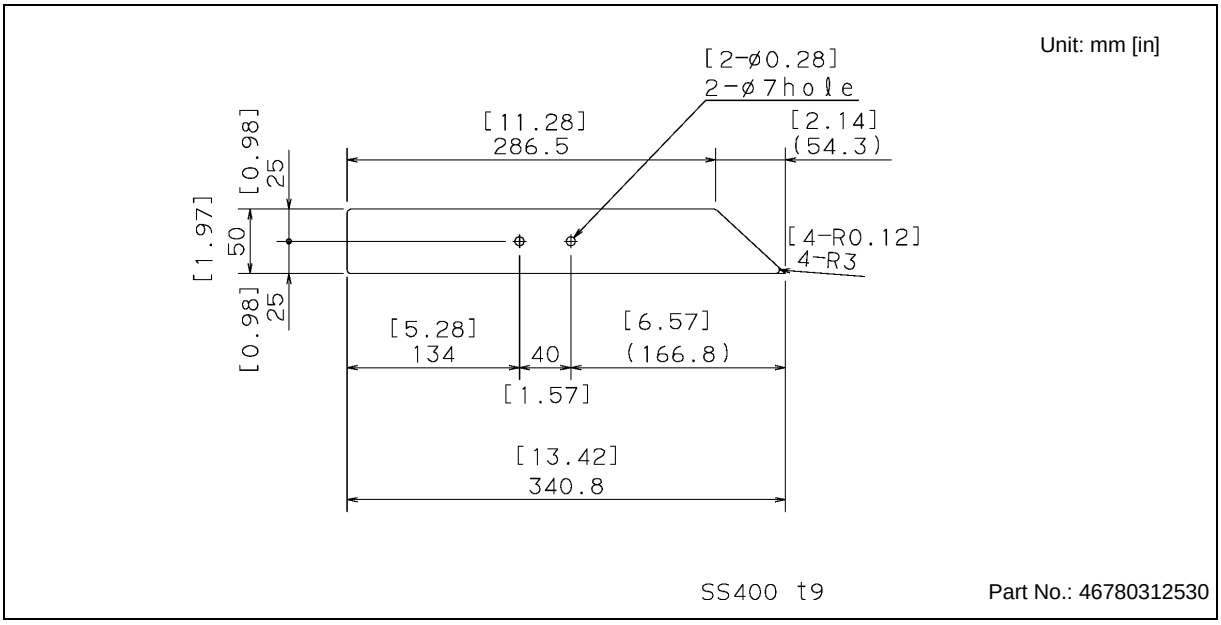

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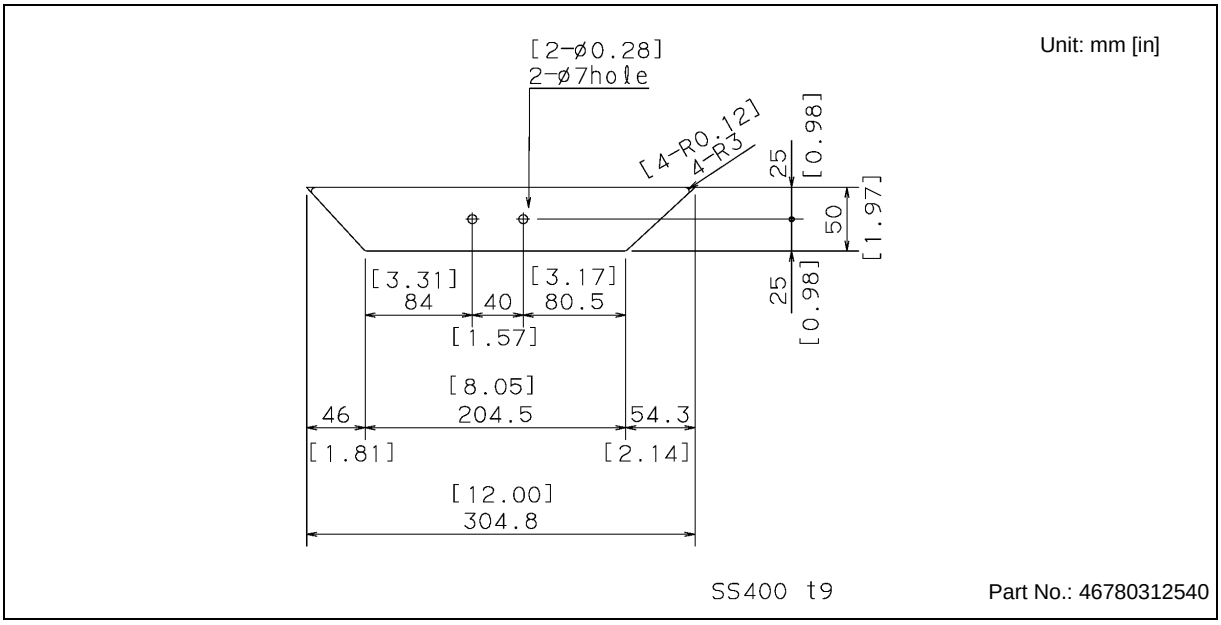


Fig. 4-151 Plate (No. 144)

2. 2-pallet changer specifications

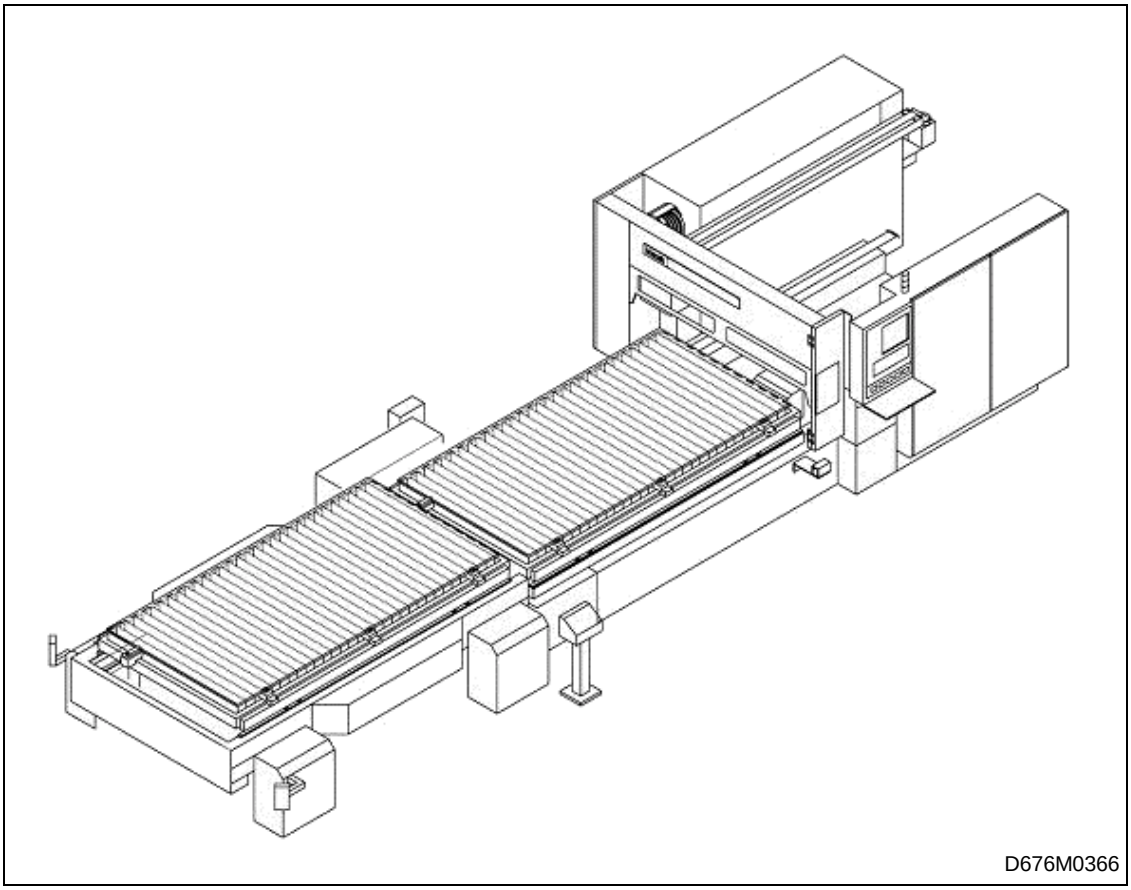


Fig. 4-152 General view

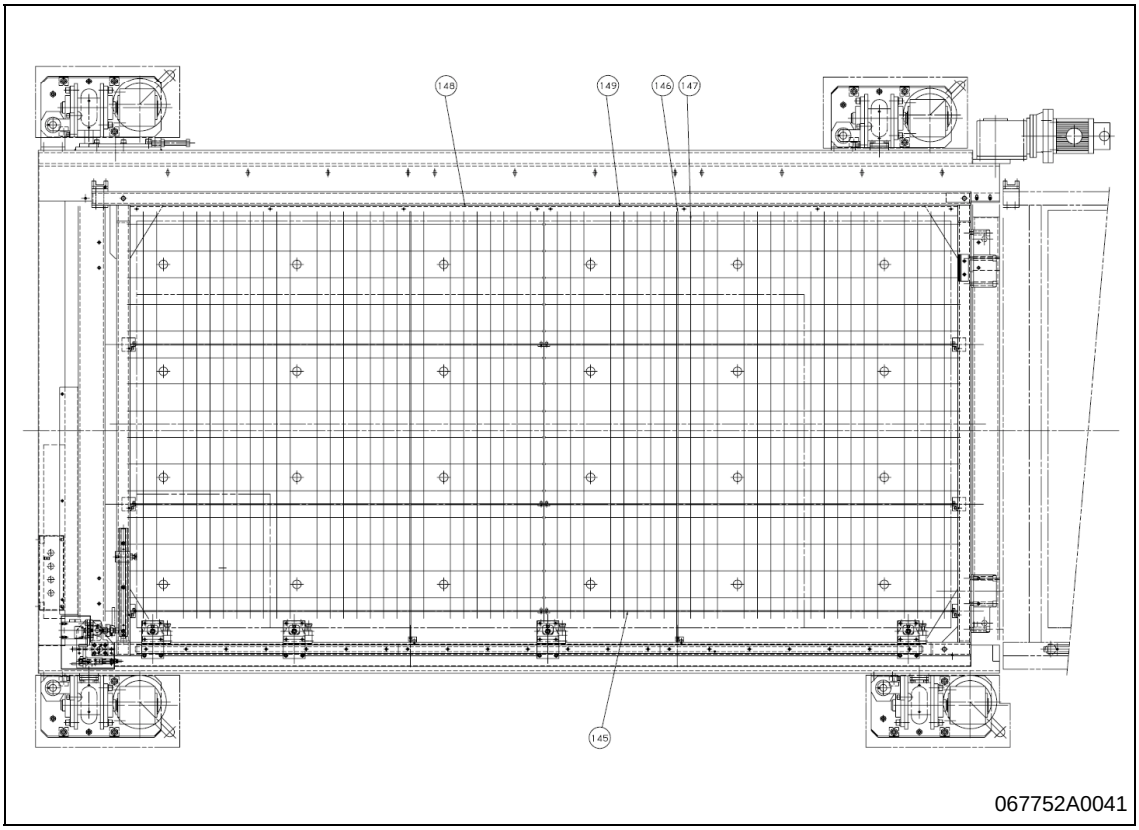


Fig. 4-153 Table assembly drawing [1] (ST-X510 MkIII) Parts for knife edge - 2-pallet changer specifications -

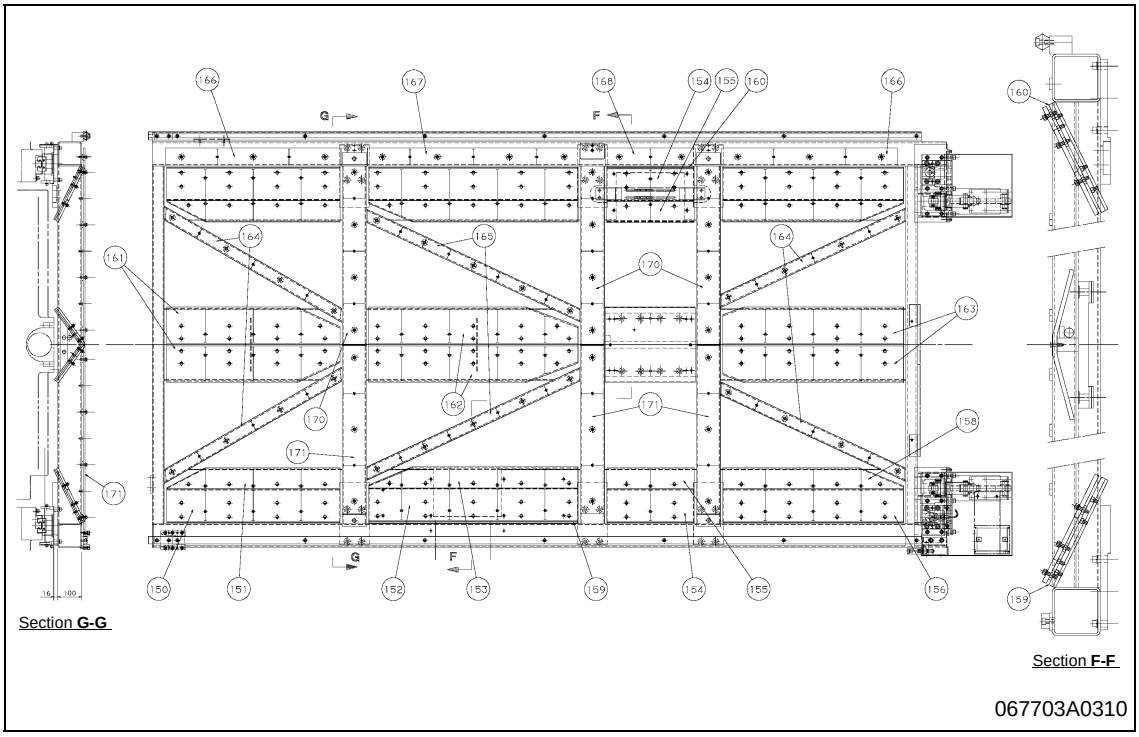


Fig. 4-154 Table assembly drawing [2] (ST-X510 MkIII) Protective plate - 2-pallet changer specifications -

Table 4-3 Table of parts (1.8 kW, 2.5 kW, 4.0 kW) - 2-pallet changer specifications -

No.	Part number	Name	ST-X48 MkIII		ST-X510 MkIII		ST-X612 MkIII		Remarks
			Standard		Standard		Standard		
145	36775200322	Knife edge	—	—	12	—	—	—	Longitudinal direction
146	36775200332	Knife edge	—	—	4	—	—	—	Transversal direction
147	36775200343	Knife edge	—	—	104	—	—	—	Transversal direction, without painting
148	36775200471	Bracket	—	—	2	—	—	—	Knife edge supporting bracket (Rear [1])
149	36775200481	Bracket	—	—	2	—	—	—	Knife edge supporting bracket (Rear [2])
150	36770313100	Plate (t9)	—	—	2	—	—	—	Table protective plate
151	36770313110	Plate (t9)	—	—	2	—	—	—	Table protective plate
152	36770313120	Plate (t9)	—	—	2	—	—	—	Table protective plate
153	36770313130	Plate (t9)	—	—	2	—	—	—	Table protective plate
154	36770313140	Plate (t9)	—	—	2	—	—	—	Table protective plate
155	36770313150	Plate (t9)	—	—	2	—	—	—	Table protective plate
156	36770313160	Plate (t9)	—	—	2	—	—	—	Table protective plate
157	46770312090	Plate (t9)	—	—	3	—	—	—	Table protective plate
158	36770313170	Plate (t9)	—	—	2	—	—	—	Table protective plate
159	36770313181	Plate (t9)	—	—	1	—	—	—	Table protective plate
160	36770313191	Plate (t9)	—	—	1	—	—	—	Table protective plate
161	36770313200	Plate (t9)	—	—	2	—	—	—	Table protective plate
162	36770313210	Plate (t9)	—	—	2	—	—	—	Table protective plate
163	36770313220	Plate (t9)	—	—	2	—	—	—	Table protective plate
164	36770313230	Plate (t9)	—	—	4	—	—	—	Table protective plate
165	36770313240	Plate (t9)	—	—	2	—	—	—	Table protective plate
166	36770313250	Plate (t9)	—	—	2	—	—	—	Table protective plate
167	36770313260	Plate (t9)	—	—	1	—	—	—	Table protective plate
168	36770313270	Plate (t9)	—	—	1	—	—	—	Table protective plate
169	36770301600	Cover（t9)	—	—	1	—	—	—	Table protective plate
170	36770313910	Plate (t9)	—	—	3	—	—	—	Table protective plate
171	36770313920	Plate (t9)	—	—	3	—	—	—	Table protective plate

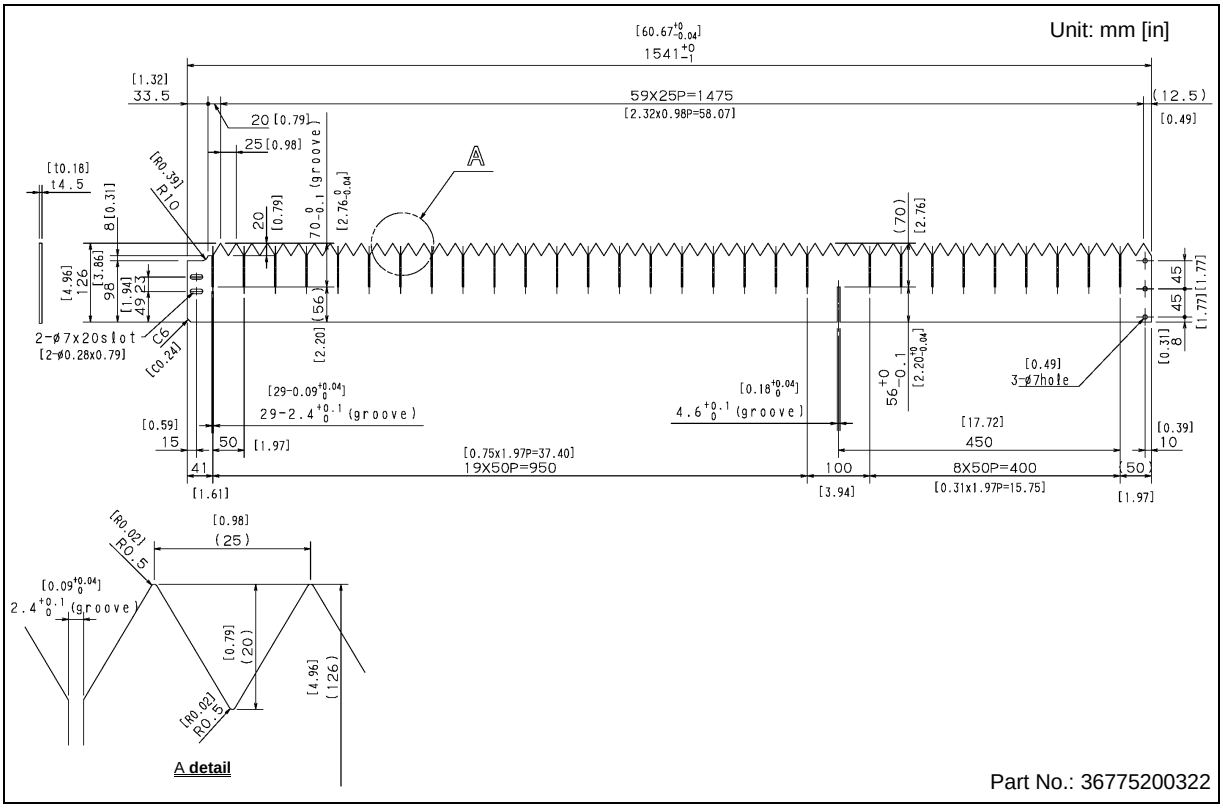


Fig. 4-155 Knife edge (No. 145)

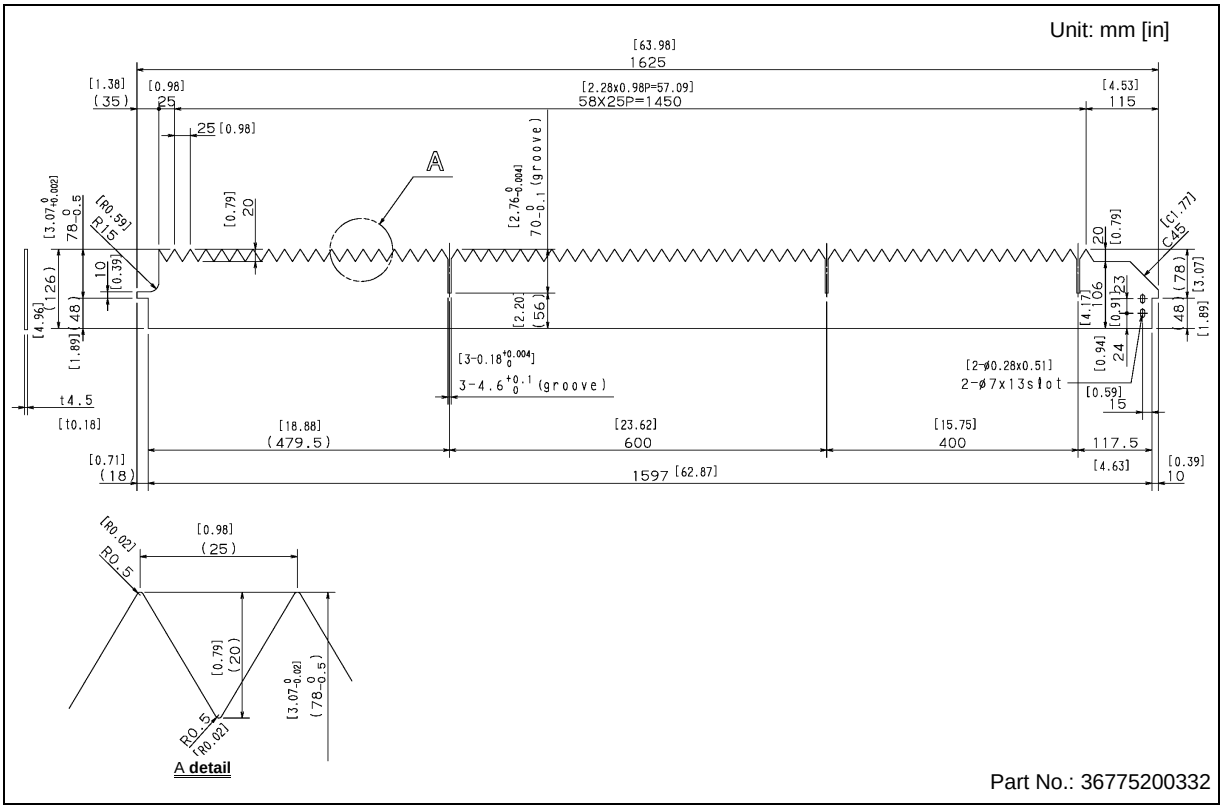


Fig. 4-156 Knife edge (No. 146)

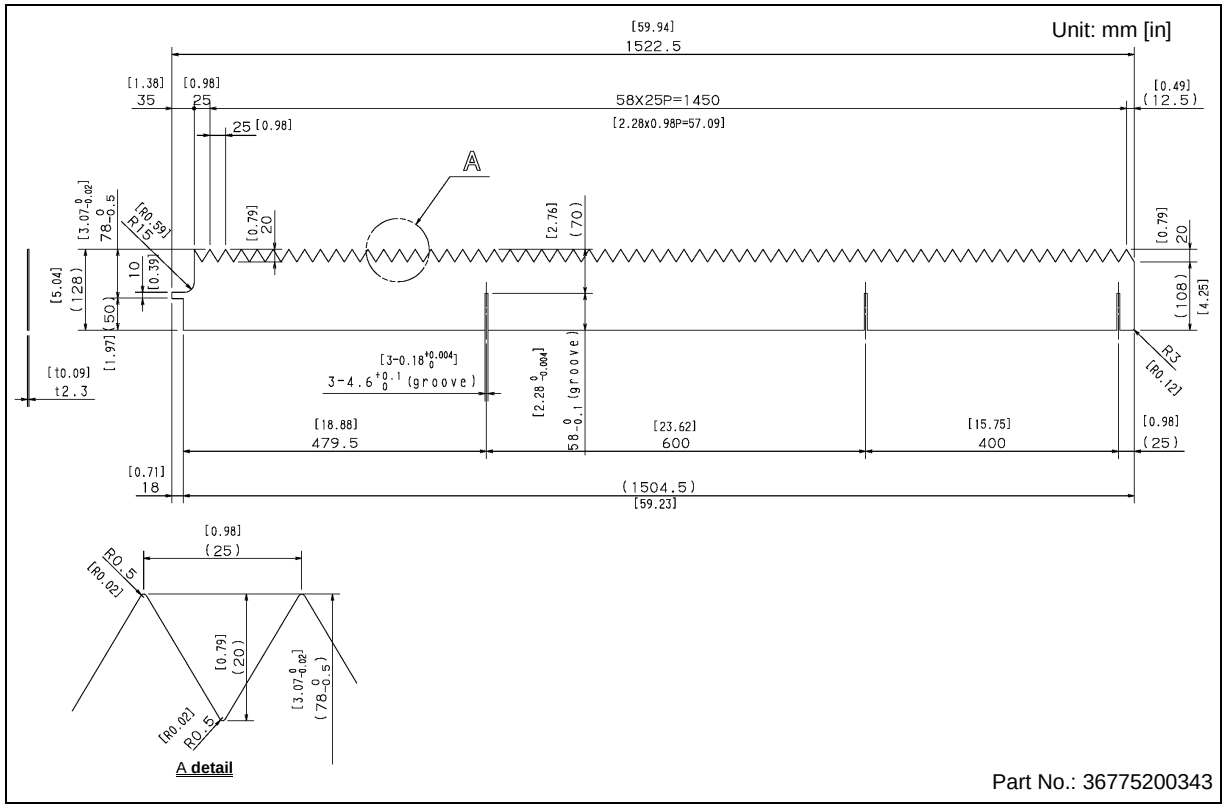


Fig. 4-157 Knife edge (No. 147)

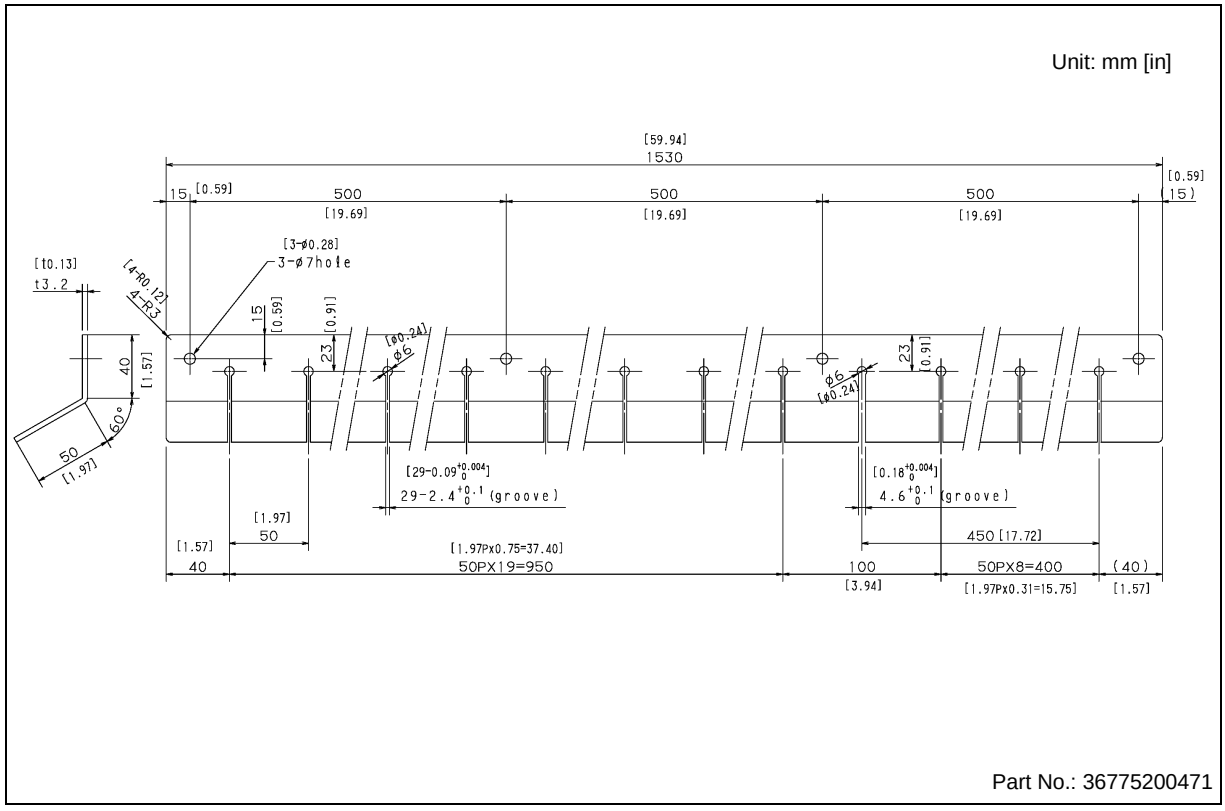


Fig. 4-158 Bracket (No. 148)

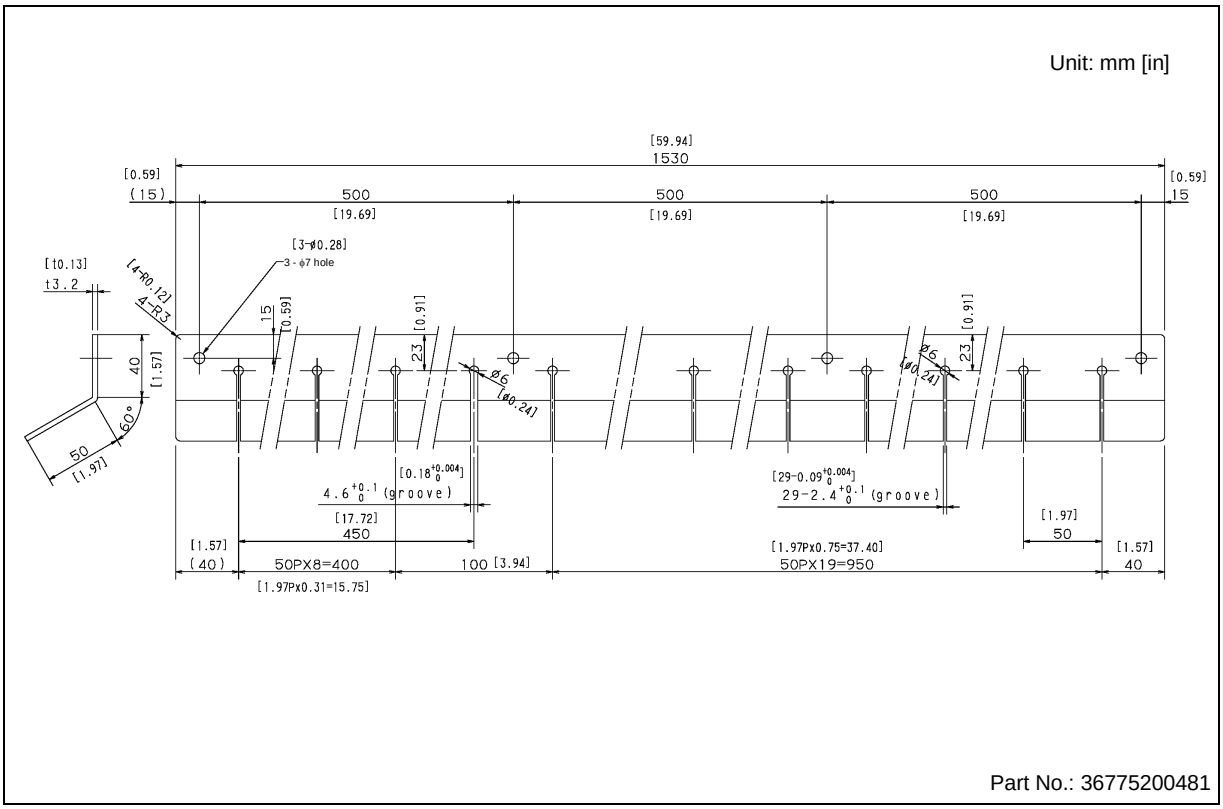
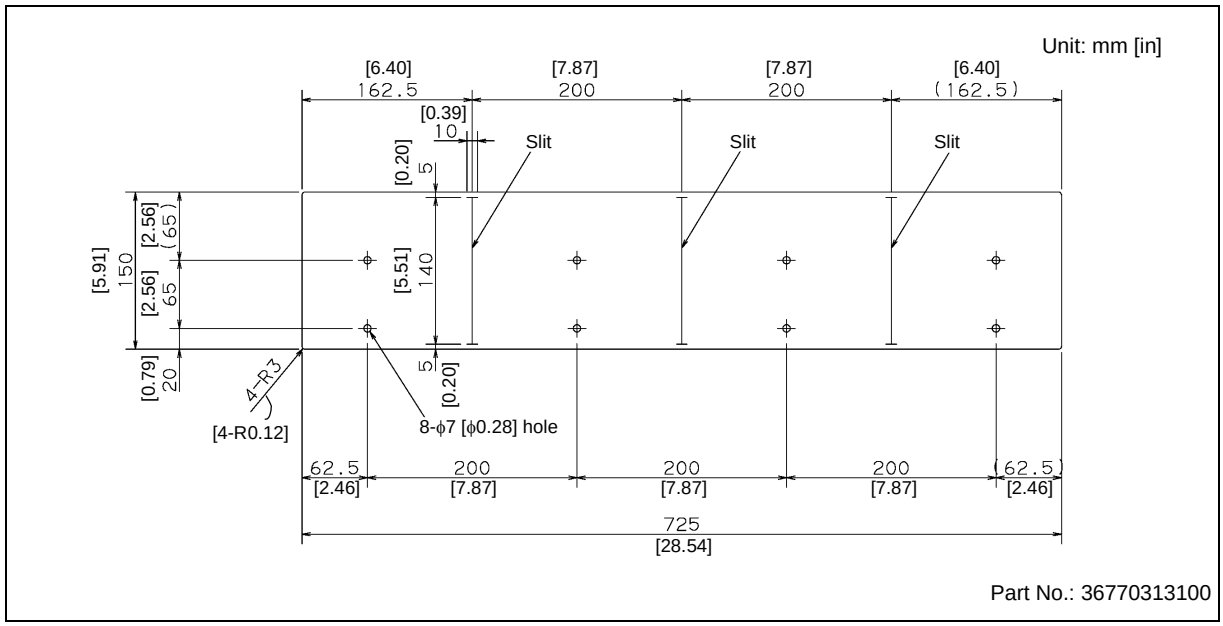


Fig. 4-159 Bracket (No. 149)



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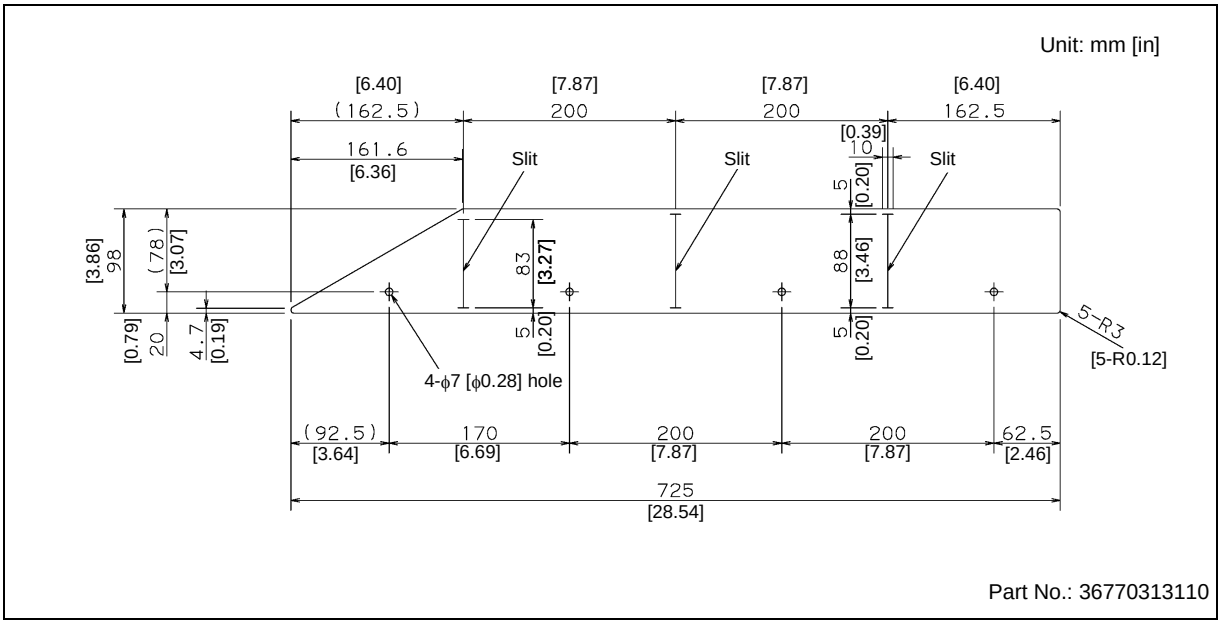

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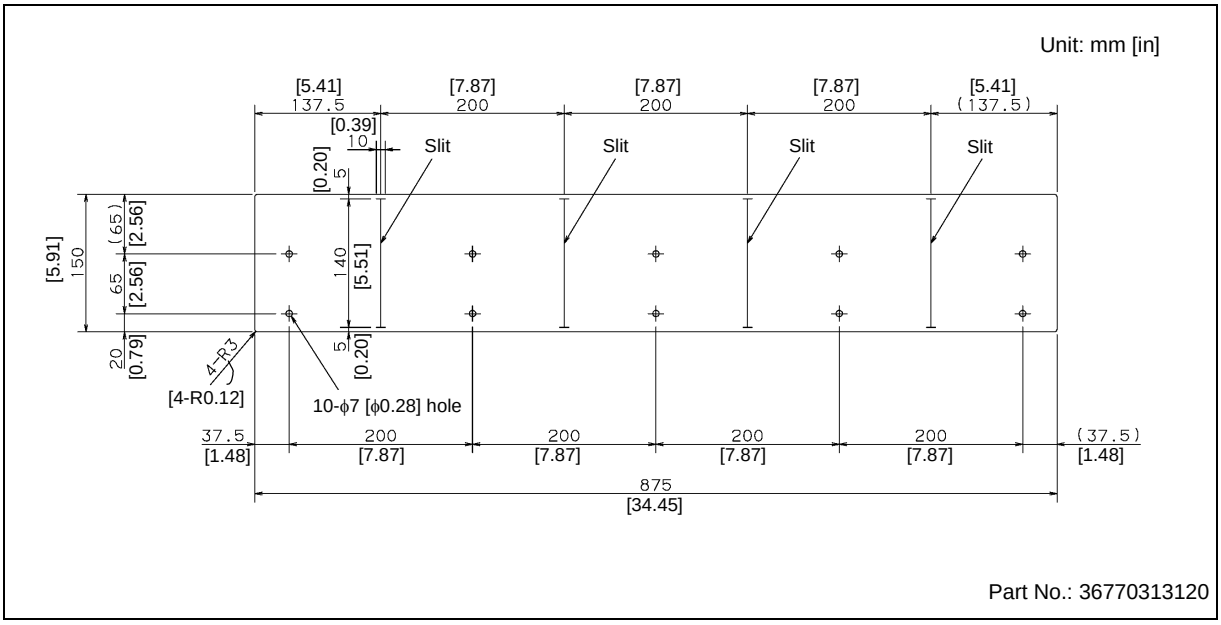

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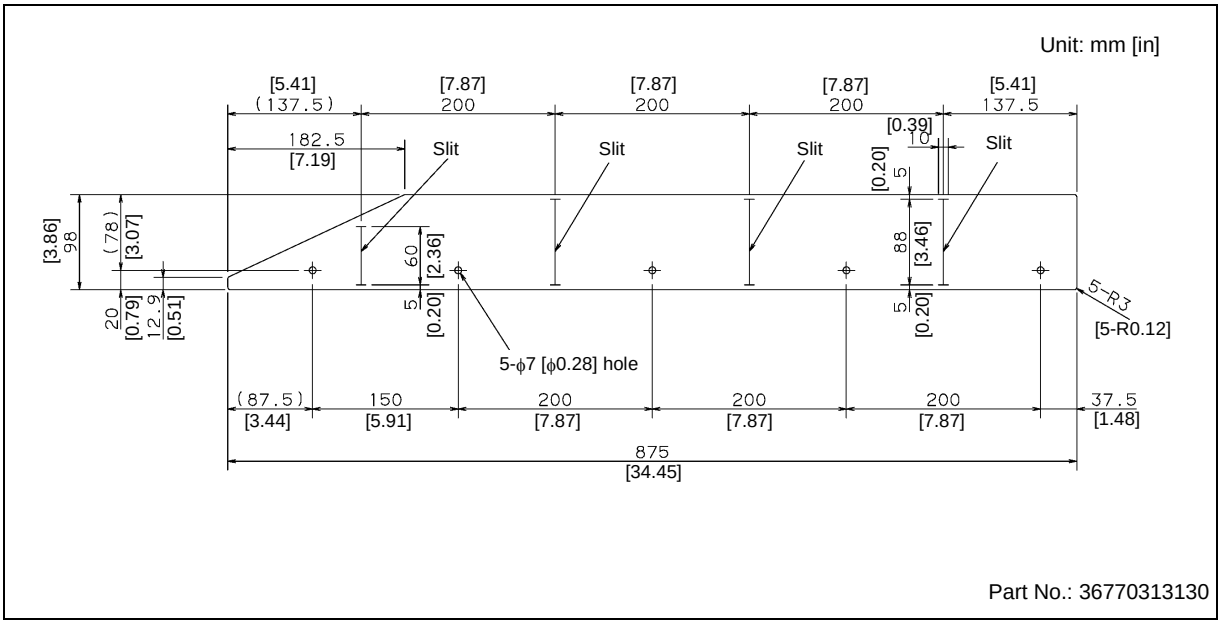

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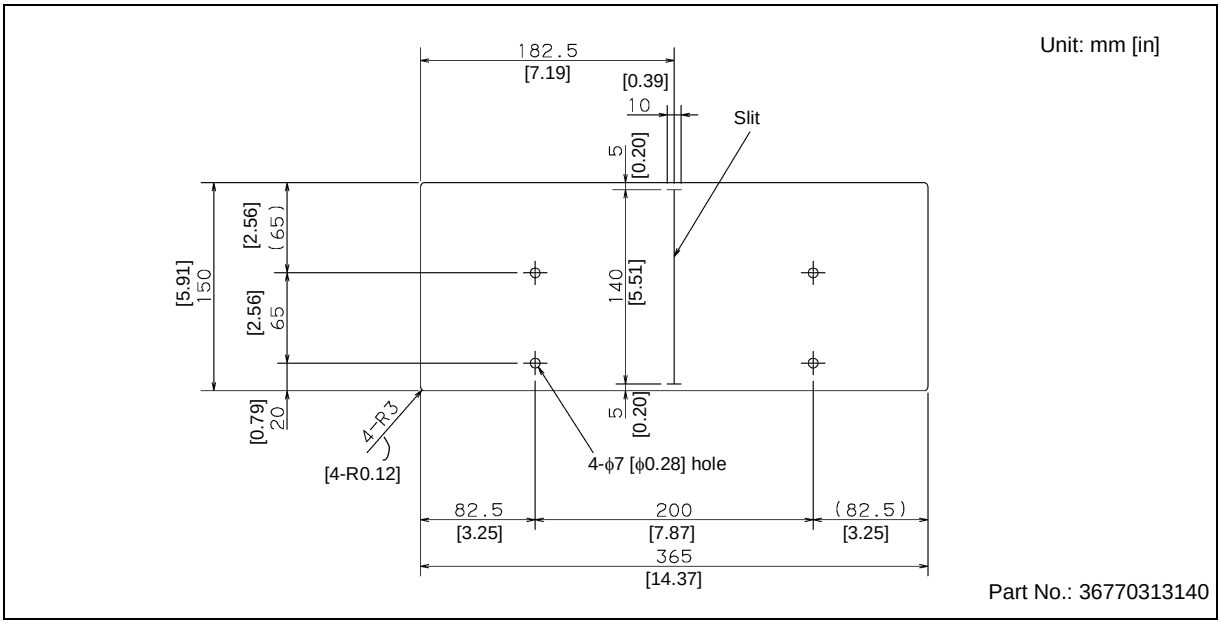

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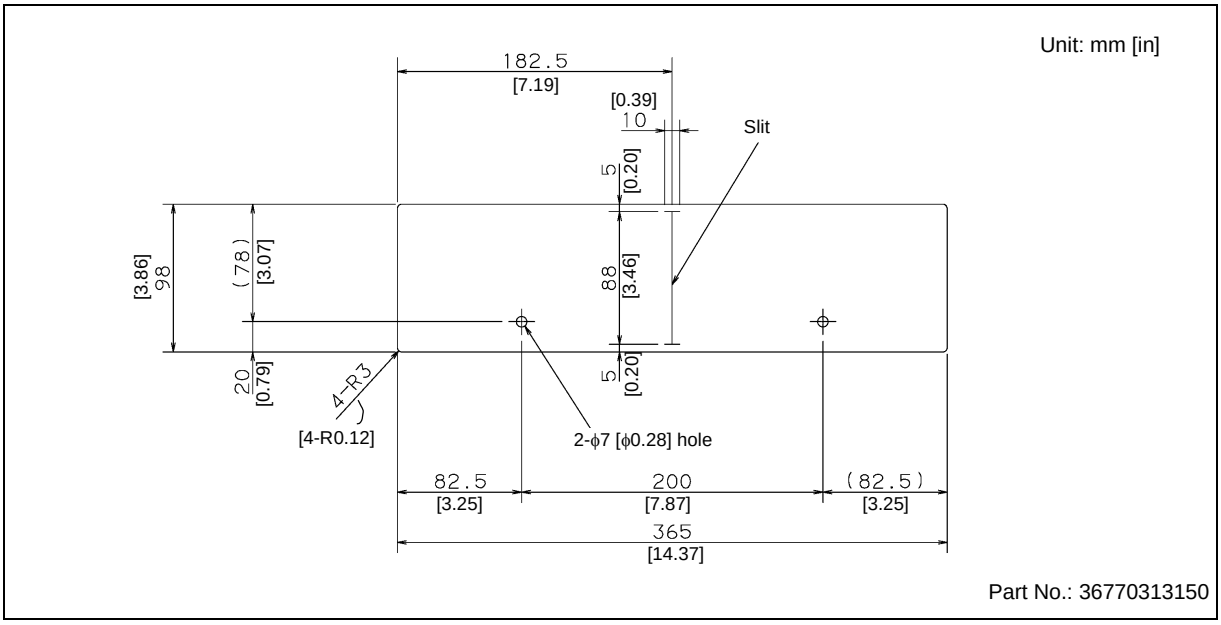

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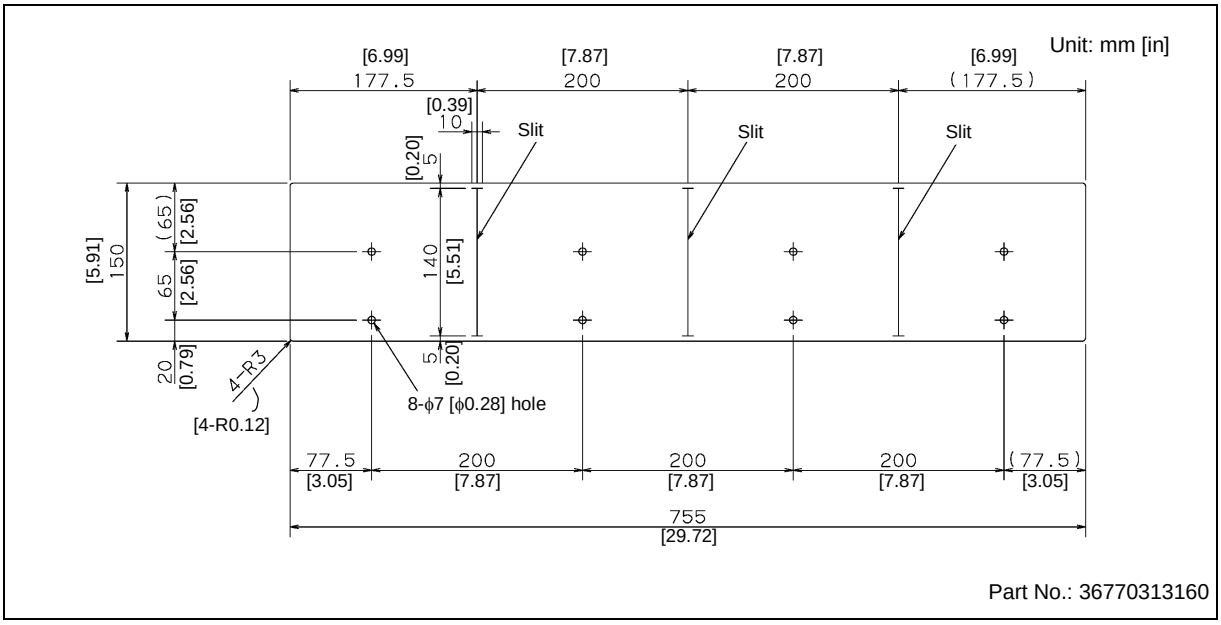

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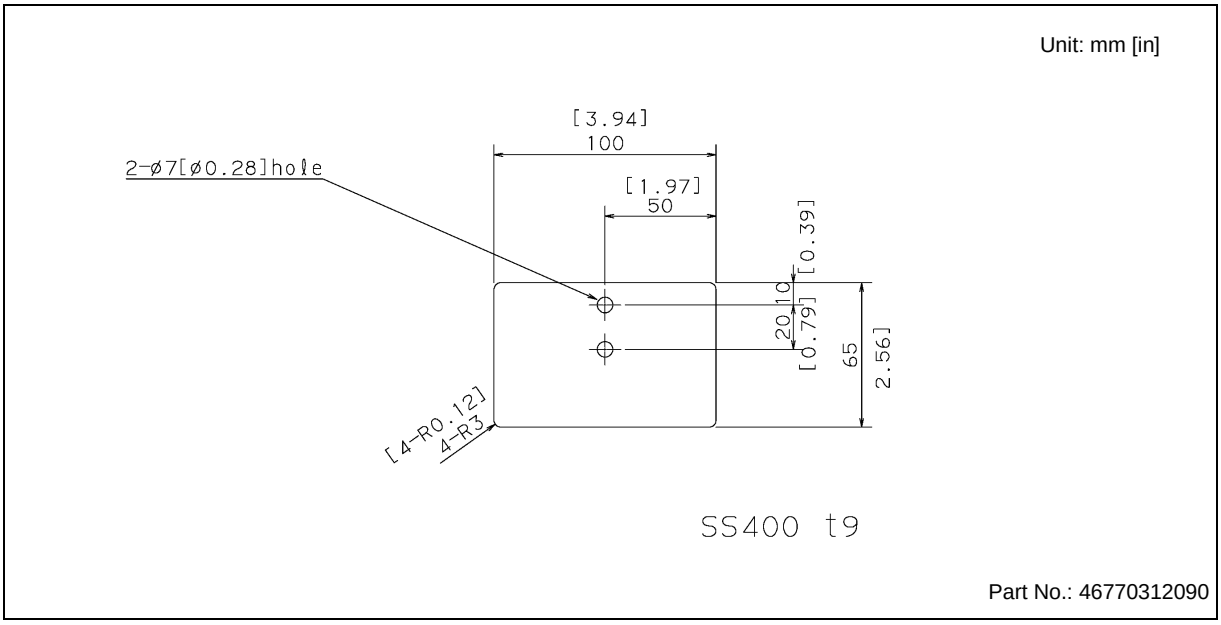

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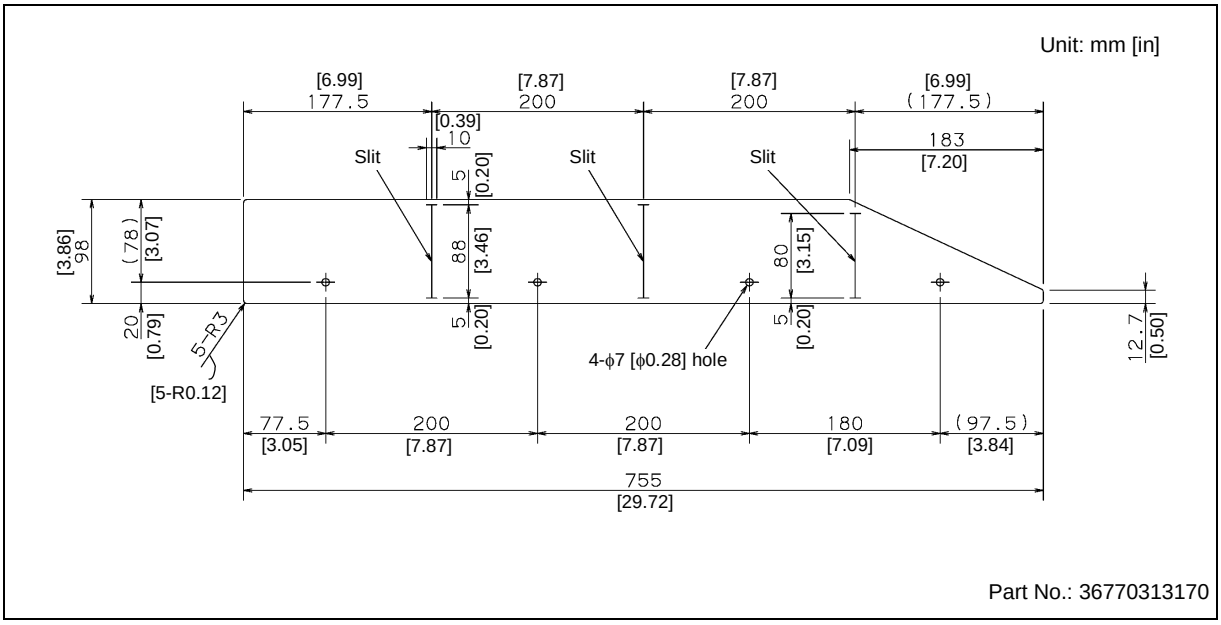

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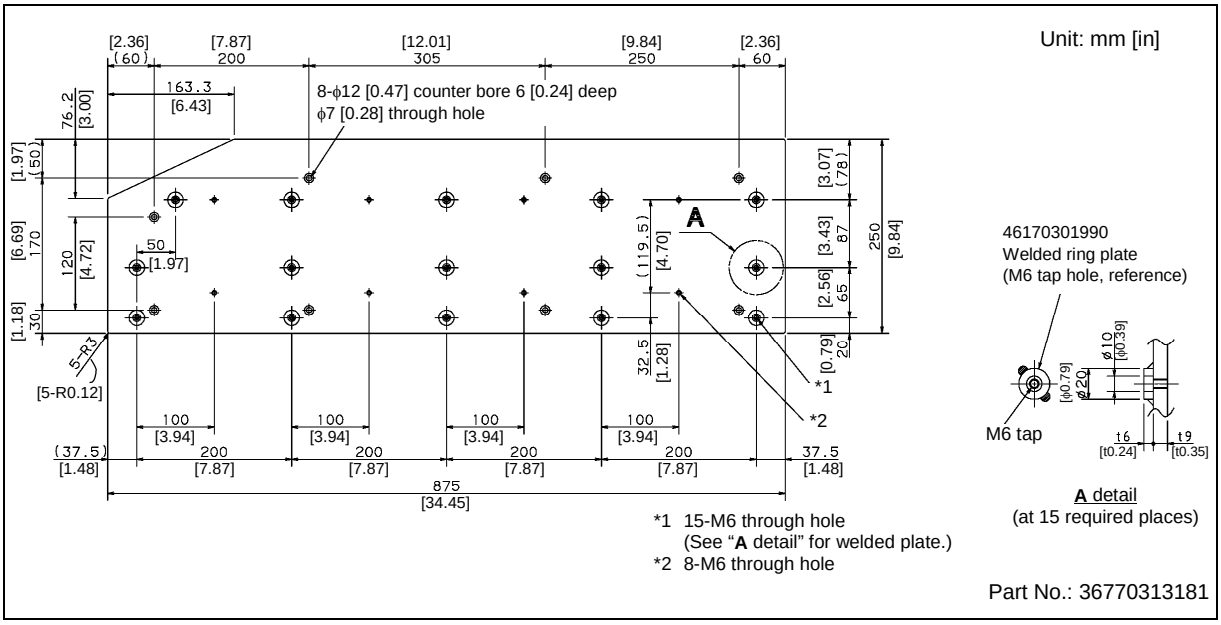

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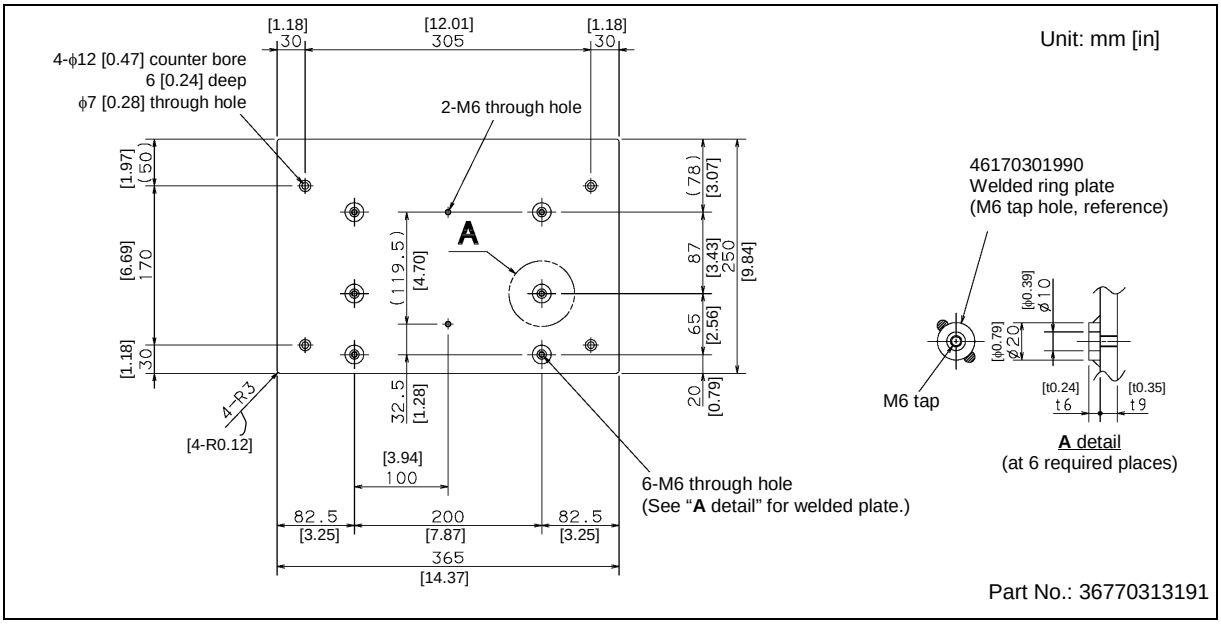

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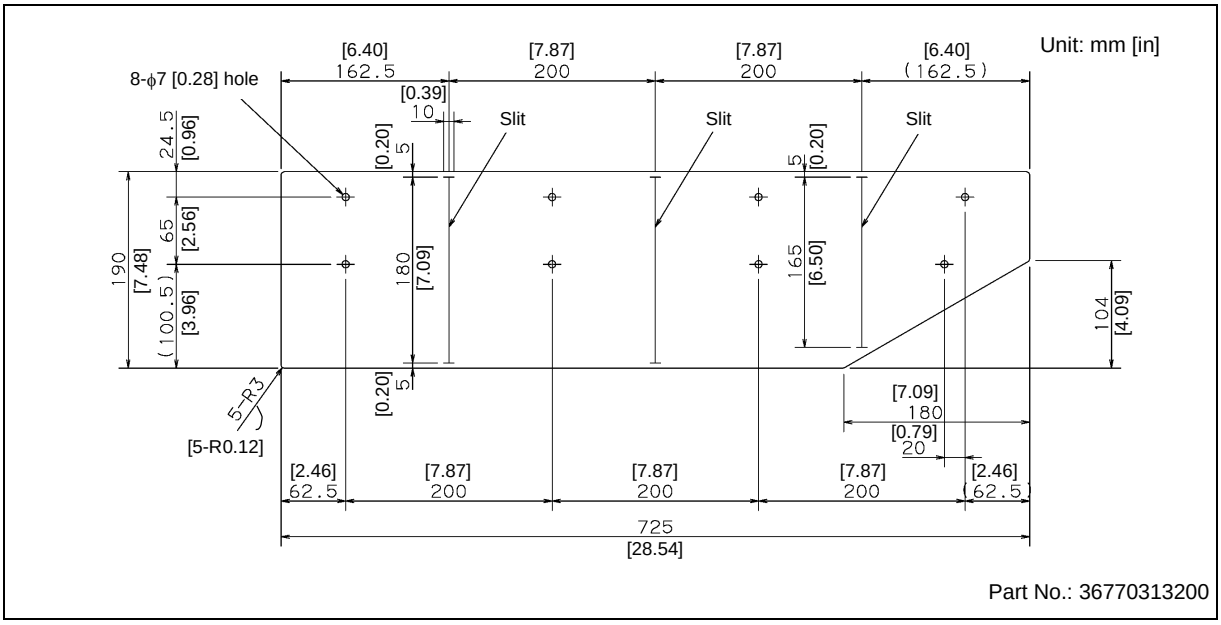

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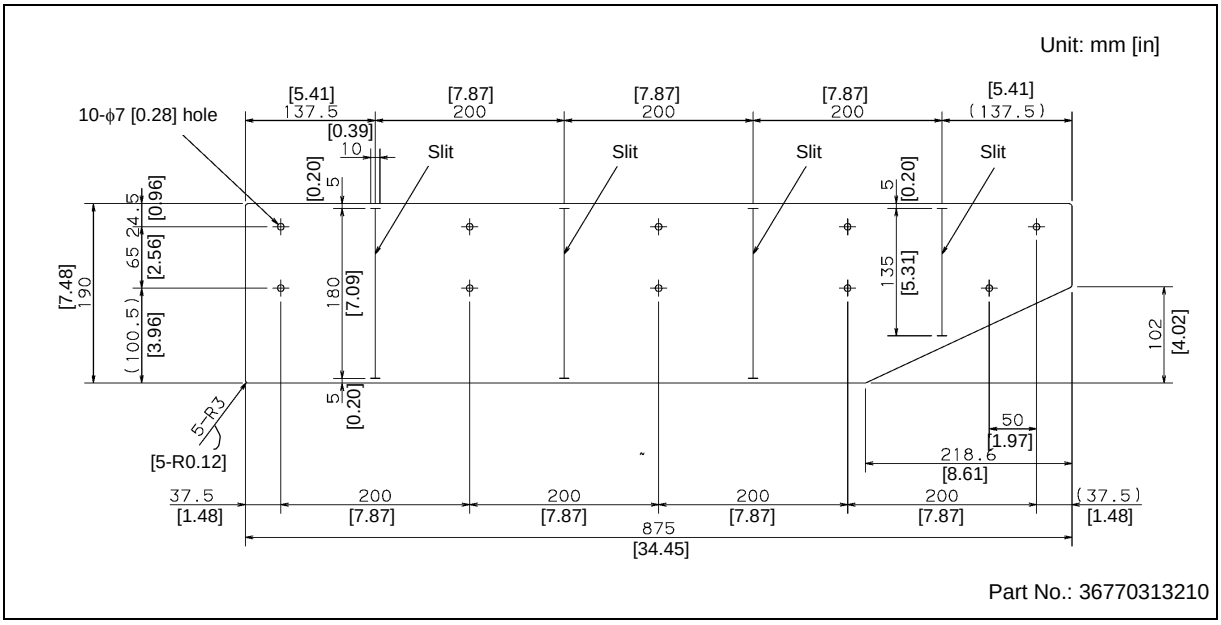

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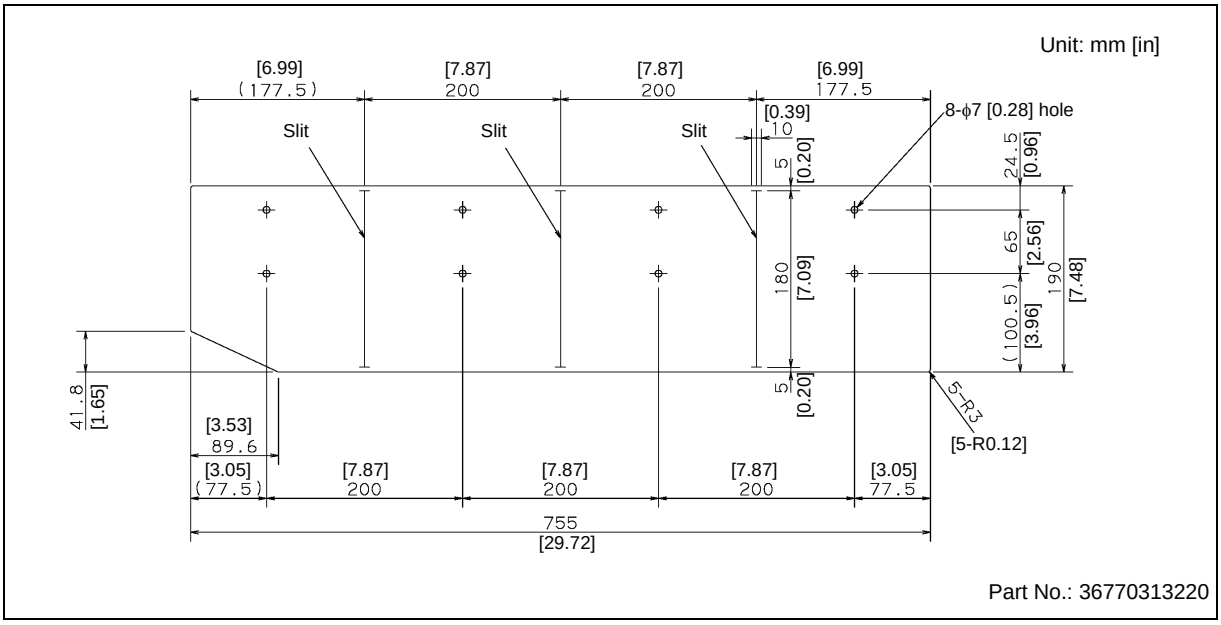

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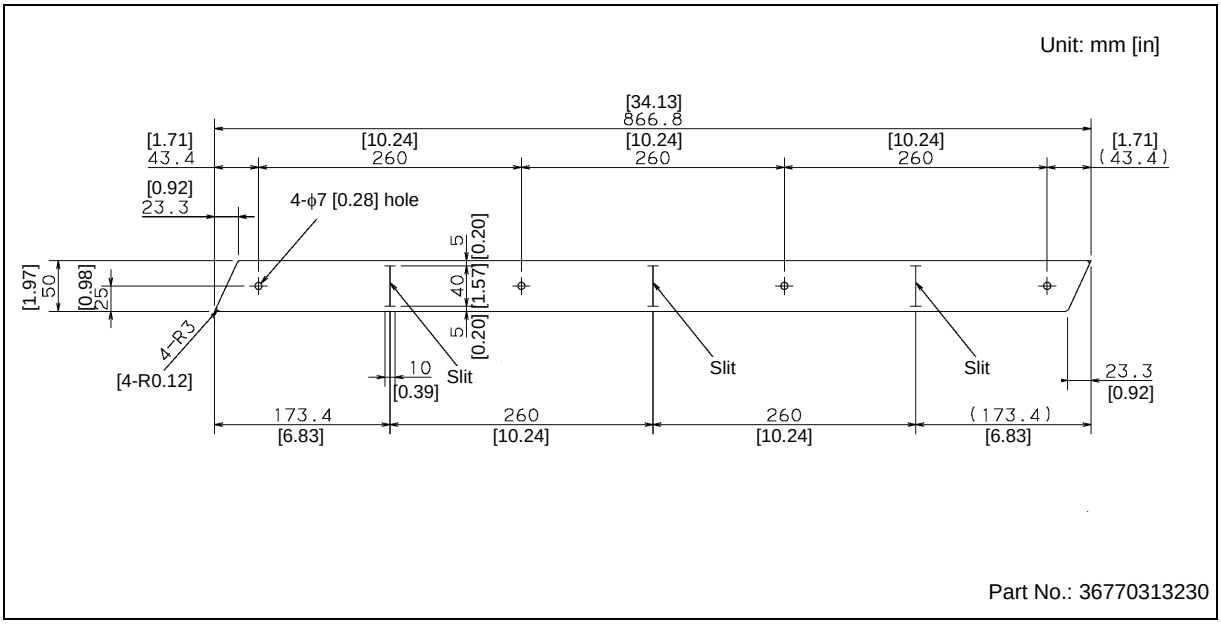

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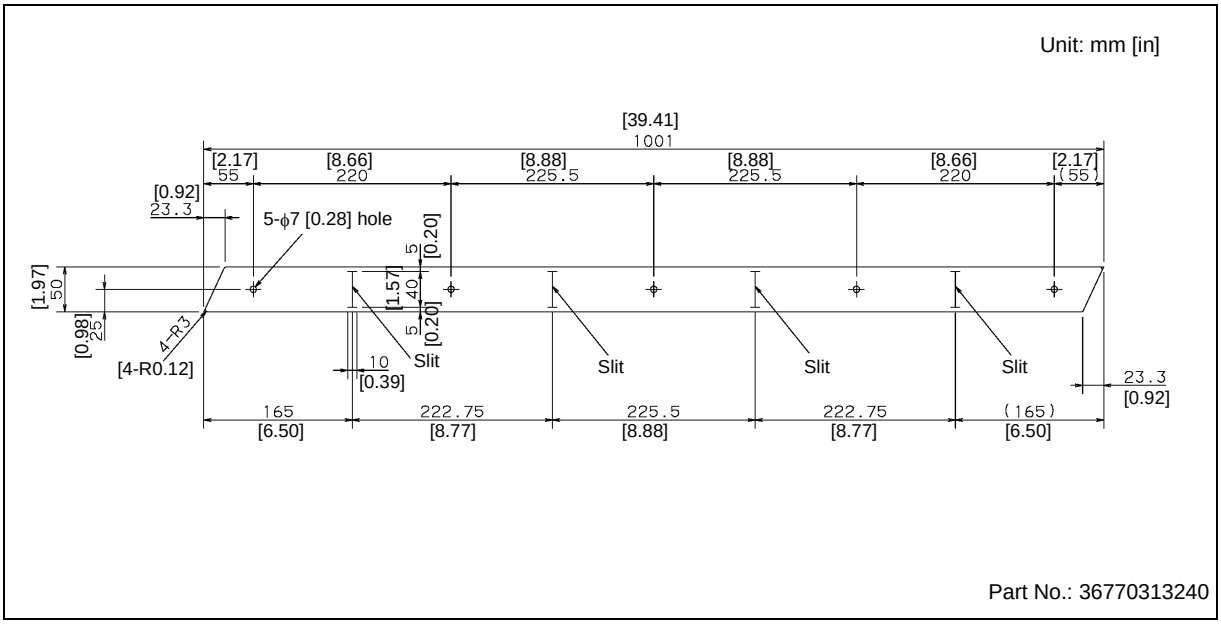

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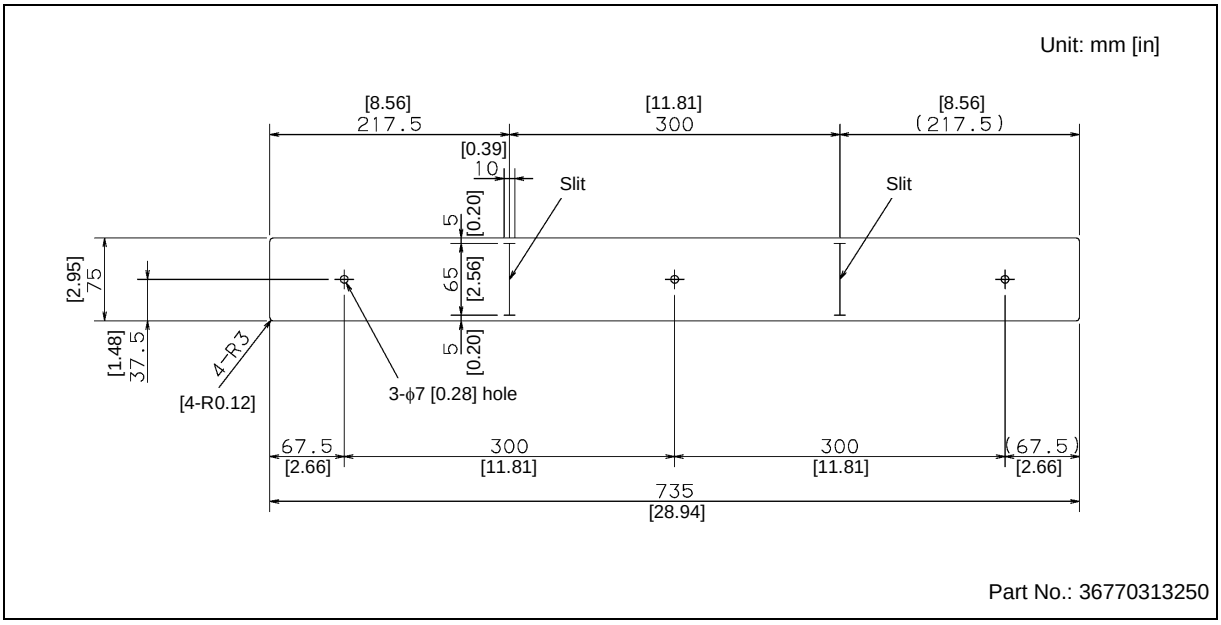


Fig. 4-176 Plate (No. 166)

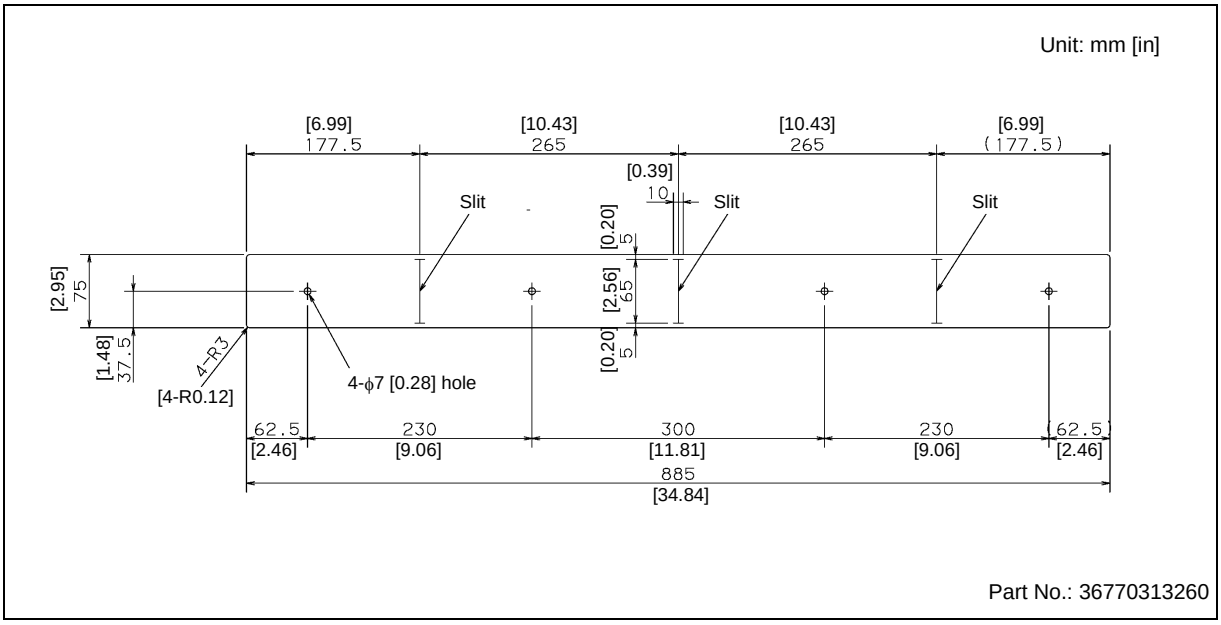


Fig. 4-177 Plate (No. 167)

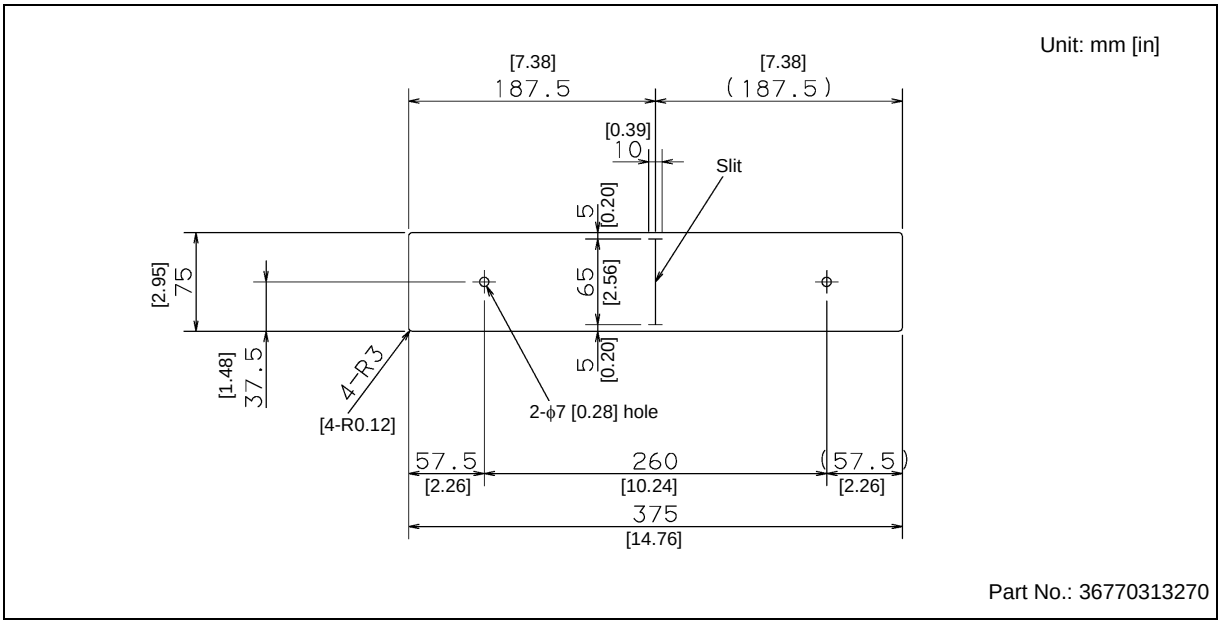


Fig. 4-178 Plate (No. 168)

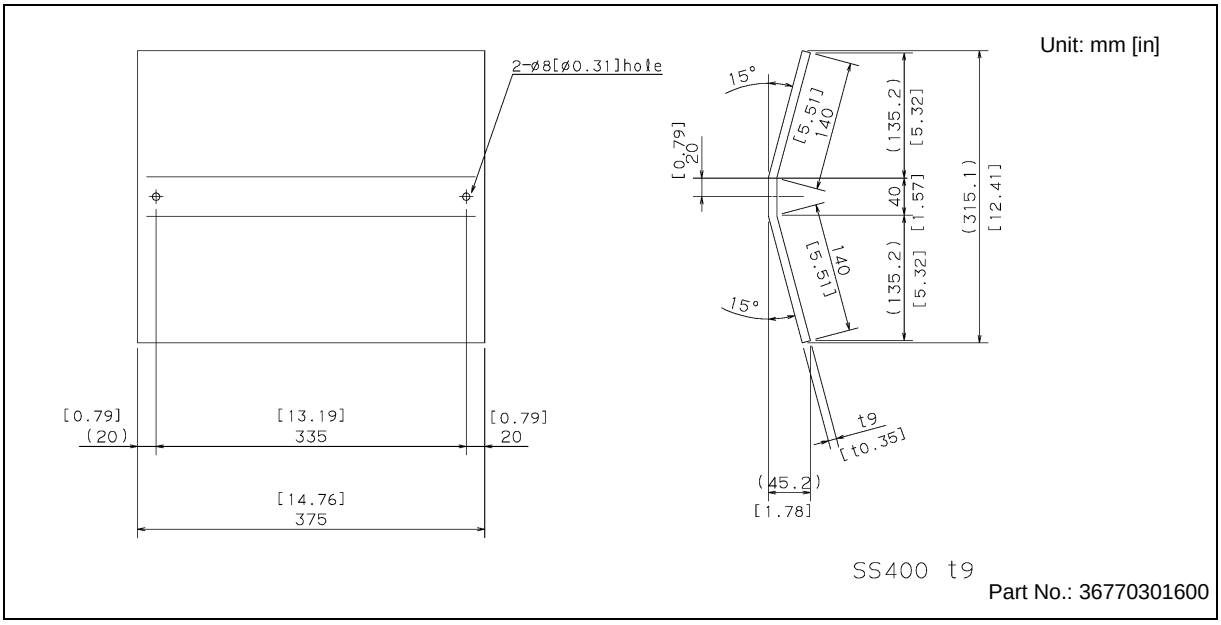


Fig. 4-179 Cover (No. 169)

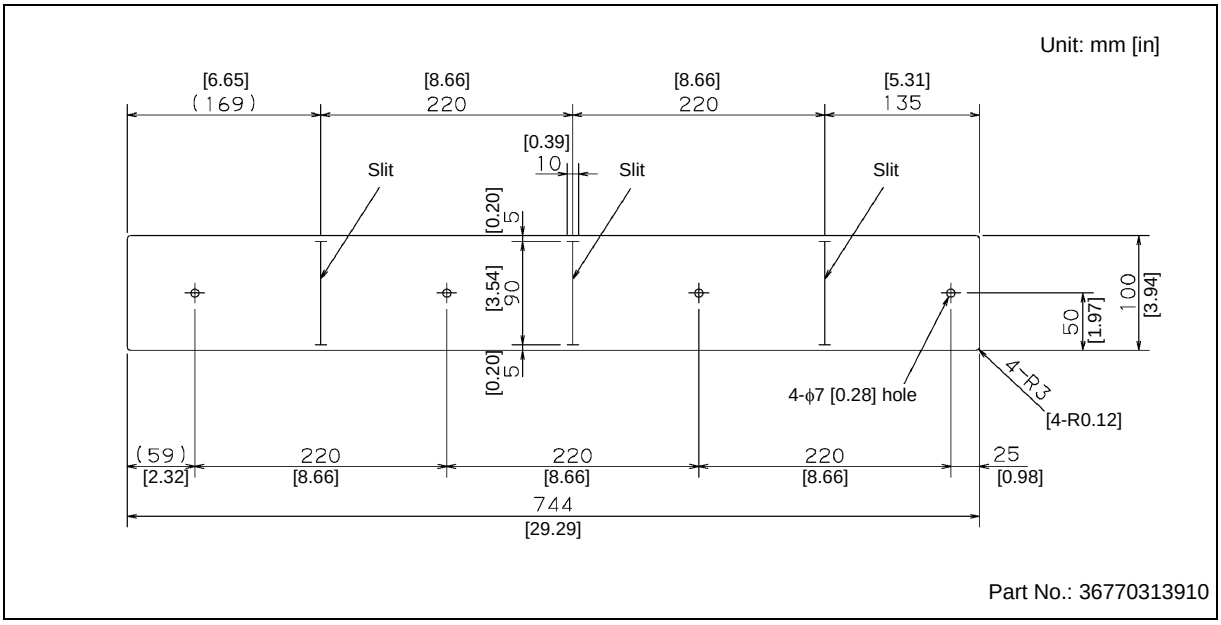


Fig. 4-180 Plate (No. 170)

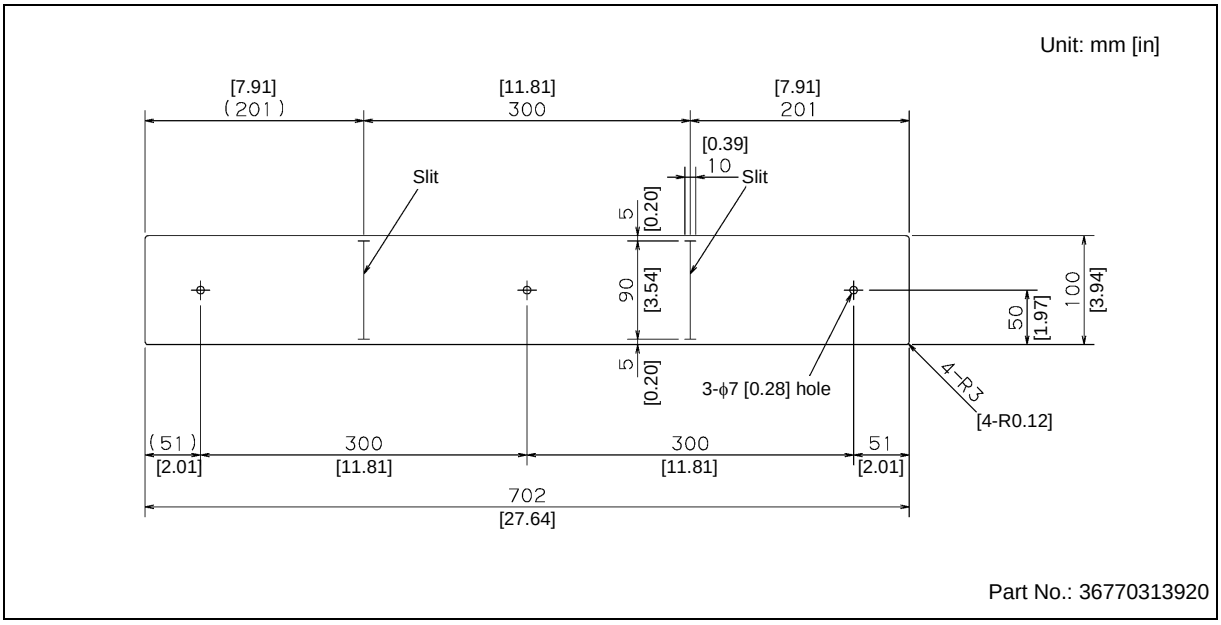


Fig. 4-181 Plate (No. 171)

- NOTE -

5 PERIODIC MAINTENANCE AND INSPECTION

To operate the laser machine, check the following items in regular intervals.
However, entrust the maintenance works excepting the replacement of oil (turbo blower oil excluded), filter and cooling water to our service engineers.

Table 5-1 Periodic maintenance and inspection items

[1] By customer [2] By Mazak (Note 1)

No.	Inspection item	Equipment	Contents	Work	[1]	[2]	Changing/cleaning interval	Reference section
1	Daily inspection		As indicated in Section 4-1.		○		Inspect every day.	Maintenance Manual 4-1
2	Vacuum pump oil	Oscillator	G32 [ESSO] 1.8 L (0.064 ft^3)	Change	○		In the first 750 hours, 1500 hours thereafter	Maintenance Manual 7-1
3	Turbo blower oil	2.5 kW oscillator	Aeroshell Turbine Oil560 [Shell] 0.68 L (0.024 ft^3)	Change	○ (Note 2)		2000 hours	Maintenance Manual 7-2
		4 kW oscillator	Aeroshell Turbine Oil560 [Shell] 0.8 L (0.028 ft^3)	Change	○ (Note 2)		2000 hours	Maintenance Manual 7-2
4	Mechanical booster oil	Oscillator	ULVAC R-4 1.5 L (0.053 ft^3) [1.8 kW]	Change	○		2000 hours	Maintenance Manual 7-2
5	Vacuum pump exhaust filter	Oscillator		Change		○	2000 hours	—
6	Electrode	Oscillator		Change		○	8000 hours	—
7	Discharge tube	Oscillator		Change		○	8000 hours	—
8	Internal bend mirror	Oscillator		Cleaning		○	2000 hours [1.8/2.5 kW] 1000 hours [4 kW] (Note 3)	—
				Change			3000 hours [1.8/2.5 kW] 2000 hours [4 kW] (Note 3)	—
9	Output mirror	Oscillator		Cleaning		○	2000 hours [1.8/2.5 kW] 1000 hours [4 kW] (Note 3)	—
				Change			4000 hours [1.8/2.5 kW] 2000 hours [4 kW] (Note 3)	—
10	Rear mirror	Oscillator		Cleaning		○	2000 hours [1.8/2.5 kW] 1000 hours [4 kW] (Note 3)	—
				Change			4000 hours [1.8/2.5 kW] 2000 hours [4 kW] (Note 3)	—
11	Filters	Oscillator		Change		○	4000 hours	—
12	Turbo blower	Oscillator		Overhaul		○	In the first 4000 hrs., 2000 hrs. thereafter	—
13	Vacuum pump	Oscillator		Overhaul		○	In the first 4000 hrs., 2000 hrs. thereafter	—

[1] By customer [2] By Mazak (Note 1)

No.	Inspection item	Equipment	Contents	Work	[1]	[2]	Changing/cleaning interval	Reference section
14	High-voltage transformer High-voltage circuit	Oscillator		Check	○		8000 hours	—
15	Convergent lens	External beam path	FL (Focal Length): 7.5" Diameter: 2"		○		To be changed if contamination or scratch is found.	Maintenance Manual Chapter 10
16	Bent mirror	External beam path	ϕ50 mm (ϕ1.97") 1 pce. [2.5/4.0 kW] 3 pcs. [1.8 kW] ϕ60 mm (ϕ2.36") 2 pcs. [2.5/4.0 kW] 1 pce. [1.8 kW] ϕ3" 1 pce. [2.5/4.0 kW]	Cleaning Change		○	2000 hours 4000 hours	—
	ATFR mirror	External beam path	1 pce. [2.5/4.0 kW]	Cleaning Change		○	3000 hours	—
17	Circular polarization mirror	External beam path	2" diameter, 1 pce.	Cleaning Change		○	2000 hours 3000 hours	—
18	Gear box oil	Machine	VACTRA OIL No. 2 [MOBIL] X-axis: 0.7 L (0.025 ft^3) [ST-X48 MkIII] 3.5 L (0.124 ft^3) [ST-X510 MkIII, ST-X612 MkIII] Y-axis: 0.6 L (0.021 ft^3) [ST-X612 MkIII]	Change	○		2000 hours	Maintenance Manual 7-5
19	Filter element	Chiller unit	2 Orion elements	Change Cleaning	○		Every month	Maintenance Manual 8-6, Maintenance Manual of the chiller unit
20	Cooling water	Chiller unit	Cleaning and water treatment agent are needed.	Change	○		Every 3 months	Maintenance Manual 8-3, Maintenance Manual of the chiller unit
21	Mechanical seal	Chiller pump	1 seal (manufactured by ORION)	Change		○	1000 hours	—
22	External filter element	Chiller unit	Filter element for MSF400	Change	○		When the differential pressure switch turns on or every 2000 hours	Maintenance Manual 8-6, Maintenance Manual of the chiller unit
23	Dust collector	Dust collector	(Note 5)	(Note 5)	○		(Note 5)	Maintenance Manual of the dust collector
		Duct	Dust disposal	Cleaning	○		Every month	Maintenance Manual 7-6
24	Scrap conveyor	Scrap conveyor	Hinge belts (all types)..... Machine oil Side chain ..... Machine oil Bearing support..... Grease	Lubrication	○		Every month	Maintenance Manual 6-3
25	Filter element	Machine	3 pcs.	Change	○		2000 hours	Maintenance Manual 7-8
26	Filter stand	Filter stand	4 pcs. (Note 4)	Change Cleaning	○		2000 hours	Maintenance Manual 7-8

[1] By customer [2] By Mazak (Note 1)

No.	Inspection item	Equipment	Contents	Work	[1]	[2]	Changing/cleaning interval	Reference section
27	Intelligent Loop System	Calibration	Checking the calibration plate	Check Cleaning	○		As required	Maintenance Manual 11
			Updating the calibration Z-coordinate	Coordinate update			Every month	
		Blue flame	Checking and replacing the plate	Check Cleaning Change			As required	
			Cleaning the window	Cleaning			Every month	
		Nozzle change magazine	Operation check Checking the tool data	Check			As required	
			Cleaning the nozzle holder	Cleaning			Every month	
		Nozzle cleaner	Checking the nozzle cleaner	Check			As required	
			Replacing the brush and grinder	Change			As required	
			Updating the nozzle cleaner operation coordinate	Coordinate update			Every month	

The hours indicated in the list above are only for reference purpose and do not show the values for guarantee.

Note 1: Please consign to Mazak Technical Center or Technology Center the items falling within the scope of Mazak. Consumables costs and part replacement expenses, however, are to be borne by the customer.

Note 2: Mazak may undertake the operation according to the particular specifications of the machine. (Refer to 7-2-2.)

Note 3: Clean or replace the mirror with a new one if the laser output reduction or laser beam distortion occurs, irrespective of its changing/cleaning interval.

Note 4: Machines with an ORION chiller unit are not provided with the filter stand.

Note 5: Refer to the maintenance manual accompanying the dust collector.

- NOTE -

6 LUBRICATION

Lubrication is indispensable for a smooth running of the machine. The following components must be lubricated carefully in accordance with the lubrication chart:

1. Ball screws of the X- and Y-axes.
2. LM guides of the X-, Y- and Z-axes.

Among the above components to be lubricated, moreover, the X- and Y-axis ball screws and LM guides must be kept clear of metallic dust and dirt to maintain the accuracy in positioning to the worksheet. Otherwise, abnormal wear would be caused on the rotary and sliding surfaces, resulting not only in the obstruction to smooth operation, but also in the reduction in positioning accuracy as well as increase in noise due to enlarged friction.

Table 6-1 Oil chart

Supply location	Model	Amount (Approx.)	Point	Recommended oil	Remarks
X-axis ball screw	ST-X48/510 MkIII	60 cm^3 (3.66 in^3)	1	Mobil Mobilax EPO or equivalent	With grease hand pump Every month (One grease hand pump squeeze supplies 0.6 cm^3 (0.04 in^3) of grease.)
	ST-X612 MkIII	72 cm^3 (4.39 in^3)			
X-axis LM guide	ST-X48/510 MkIII	18 cm^3 (1.10 in^3)			
	ST-X612 MkIII	24 cm^3 (1.46 in^3)			
Y-axis ball screw	ST-X48/510 MkIII	54 cm^3 (3.30 in^3)			
	ST-X612 MkIII	36 cm^3 (2.20 in^3)			
Y-axis LM guide	ST-X48/510/612 MkIII	12 cm^3 (0.73 in^3)			
Z-axis LM guide	ST-X48/510/612 MkIII	2.4 cm^3 (0.15 in^3)			

6-1 Lubrication of the X-, Y- and Z-Axis (Ball Screw and LM Guide)

Supply grease from the distributors (indicated below by the corresponding arrow) with a grease hand pump sufficiently until grease breaks out on the sliding surface.
Each squeeze of the grease hand pump delivers 0.6 cm^3 (0.04 in^3) of grease.

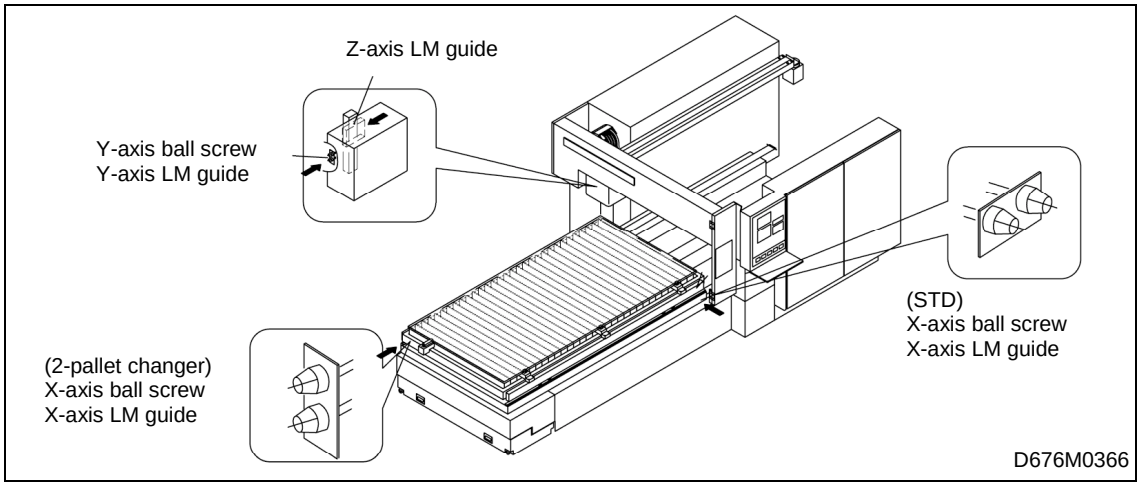


Fig. 6-1 Lubrication of the X-, Y- and Z-axis

6-2 Lubrication of the Scrap Conveyor

The scrap conveyor for the laser machine is not lubricated by cutting oil, etc. during processing, therefore the periodic lubrication is absolutely necessary.

If the periodic lubrication is not performed, abnormal wear of sliding area of scrap conveyor or abnormal sound may occur.

In the worst case, the driving resistance increases excessively, which results in stop of conveyor.

Lubricating points of scrap conveyor

1. Hinge link (whole of the belt)
2. Side chain
3. Main bearing

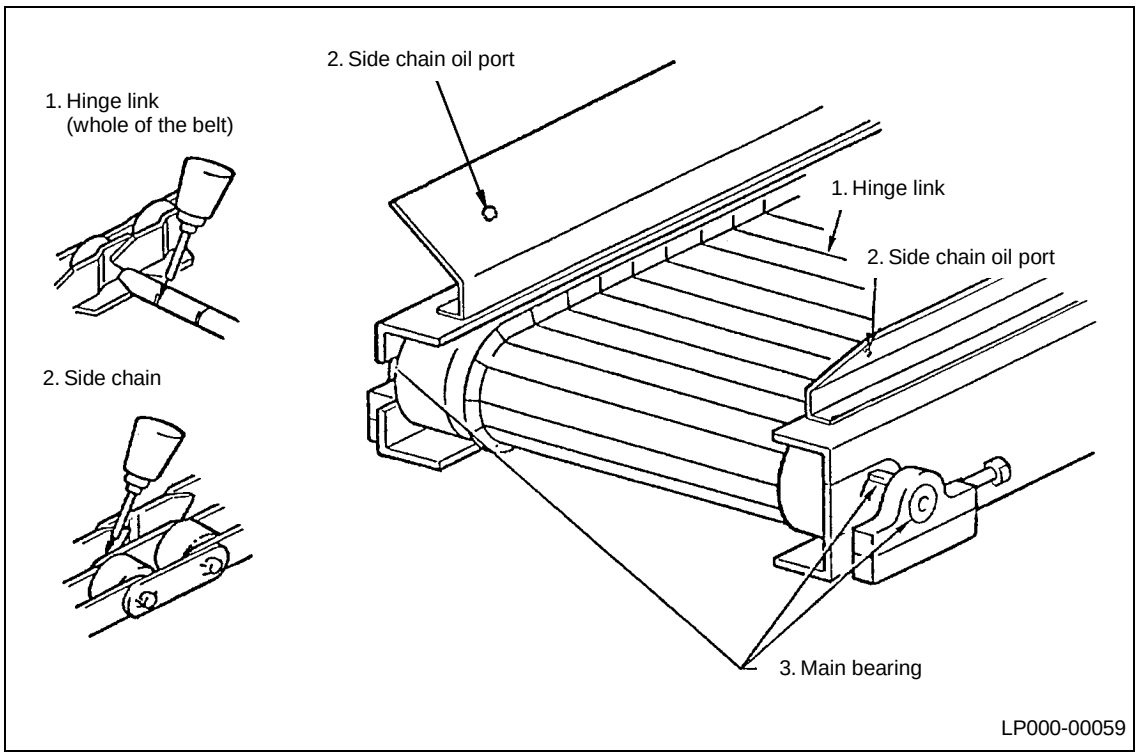


Fig. 6-2 Lubricating points of scrap conveyor

Lubrication table

Oil supply location	Supply oil quantity	Recommended oil	Lubrication interval
Hinge link (whole of the belt)	Lubricate the conveyor to the extent that the surface becomes wet from the transportation side of conveyor belt using a lubricator.	Machine oil (according to ISO VG46)	Once per month
Side chain	Lubricate the conveyor to the extent that the whole circumference of side chain becomes wet from the designated oil port using a lubricator.	Machine oil (according to ISO VG46)	Once per month
Main bearing		Grease (MOBIL TEMP No. 1 or equivalent)	Once per month

The scrap conveyor has a cleat for clearing scraps and sludge away from the conveyor interior.

One cleat is provided for all links, and the cleat is bolt-secured.

If the cleat is damaged for reasons such as the fall of the worksheet, manufacture cleats and replace the damaged cleat with a new one. (Cleats of the ST-X612 MkIII cannot be replaced.)

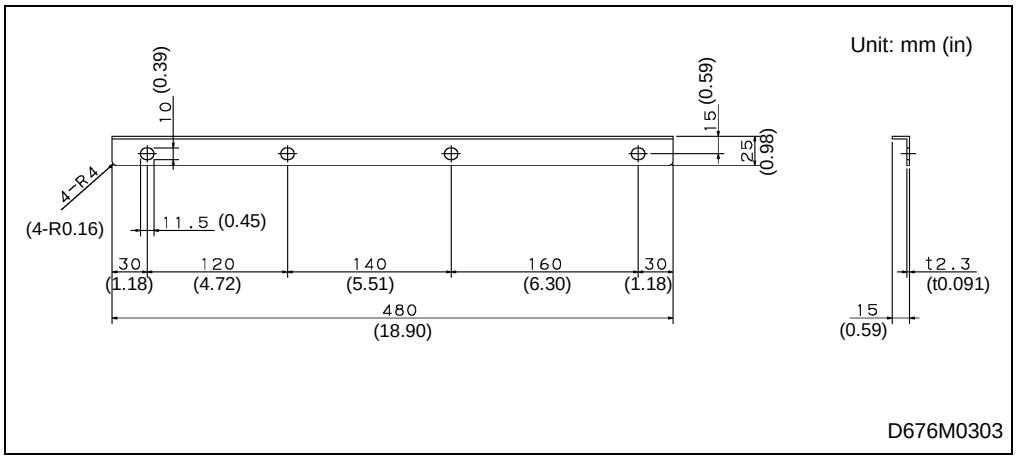


Fig. 6-3 Cleat [ST-X48 MkIII]

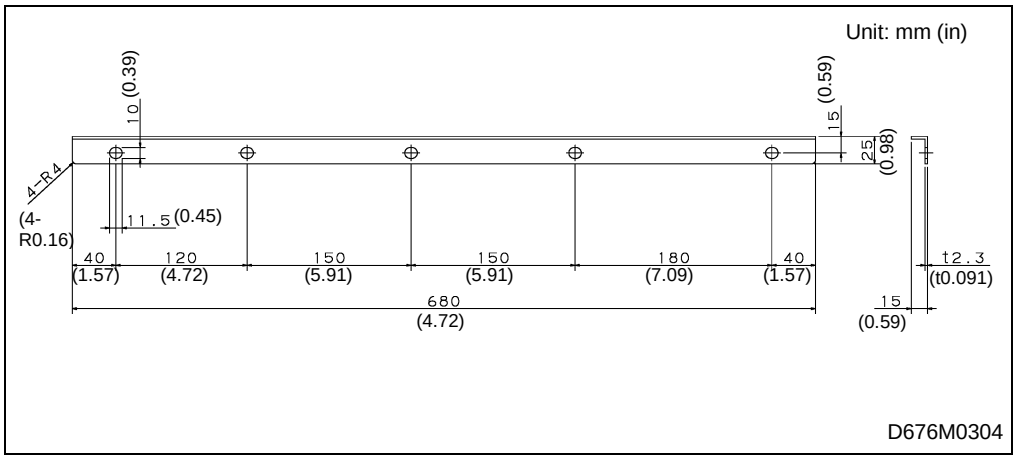


Fig. 6-4 Cleat [ST-X510 MkIII]

- NOTE -

7 OIL CHANGE AND MAINTENANCE

Table 7-1 Oil change

	Location	Oil name	Exchange cycle	Appli-cability	Oil quantity [Unit: L (ft^3)]
Oscillator	Vacuum pump oil	G32 (ESSO)	Change oil entirely in the first 750 hours, 1500 hours or 12 months thereafter.	Yes	1.8 (0.064)
	Turbo blower oil (**Note**)	Aeroshell Turbine Oil 560 (Shell)	Change oil entirely every 2000 hours or 12 months.	Yes	0.68 (0.024) [2.5 kW] 0.8 (0.028) [4 kW]
	Mechanical booster oil	ULVAC R-4	Change oil entirely every 2000 hours or 12 months.	Yes	1.5 (0.053) [1.8 kW]
Machine	X-axis gear box oil	VACTRA OIL No. 2 (Mobil)	Change oil entirely every 2000 hours.	Yes	0.7 (0.025) [ST-X48 MkIII] 3.5 (0.124) [ST-X510/612 MkIII]
	Y-axis gear box oil	VACTRA OIL No. 2 (Mobil)	Change oil entirely every 2000 hours.	Yes	0.6 (0.021) [ST-X612 MkIII]

Note: Mazak may undertake the operation according to the particular specifications of the machine. (Refer to 7-2-2.)

7-1 Maintenance of the Vacuum Pump

1. Checking the quality and quantity of oil (every day)

1. Check the oil quantity at the oil-level glass and replenish oil as required.
2. Check the oil quality through the oil-level glass in comparison with the relevant check sheet attached nearby on the vacuum pump housing.
3. Replacement interval (Oil)

   After the initial lapse of 750 operation hours, then every 1500 hours.
4. Replacement interval (Exhaust filter)

   Every 4000 operation hours.

2. Oil change for the vacuum pump

A. Requirements

Screwdriver (Large size)
Oil jug (Accessory)
Oil: 1.8 L, or 0.064 ft^3, of G32 (ESSO)
Oil pan, with a capacity of 2 L or 0.071 ft^3
Wrench
Waste cloth

B. Changing procedure

(1) Switch off the laser operation.
(The machine, if having been stopped, has to be run, or warmed up, beforehand for about 15 minutes.)

(2) Turn off the main power.

(3) Let the machine cool down for about half an hour.

CAUTION

- Keep in mind that the oil is very hot just after the stop of the machine and, accordingly, take care not to get burned.

Carry out the following steps with the vacuum pump having been cooled down to the extent that it can be touched safely.

(4) Remove the lower cover of the laser power unit.

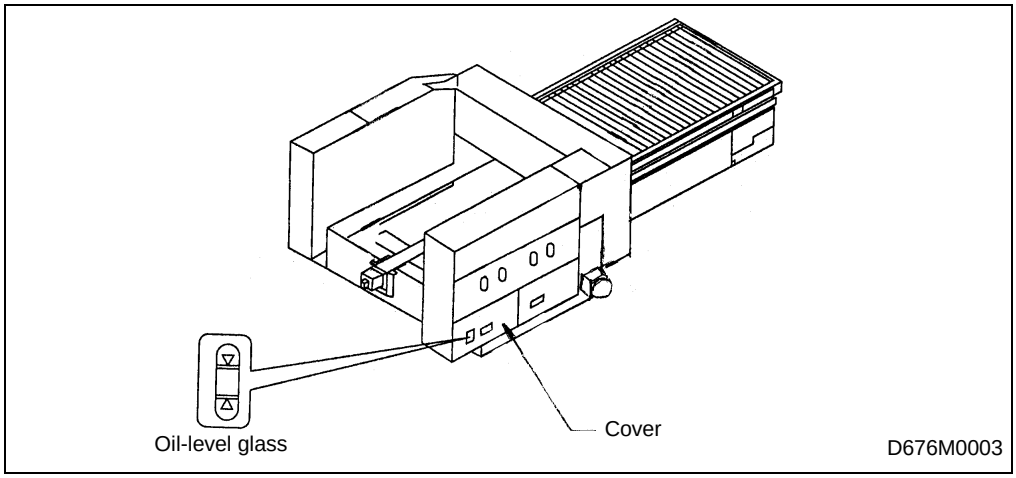


Fig. 7-1 Lower cover of the laser power unit

(5) Place a container under the oil drain valve of the vacuum pump.

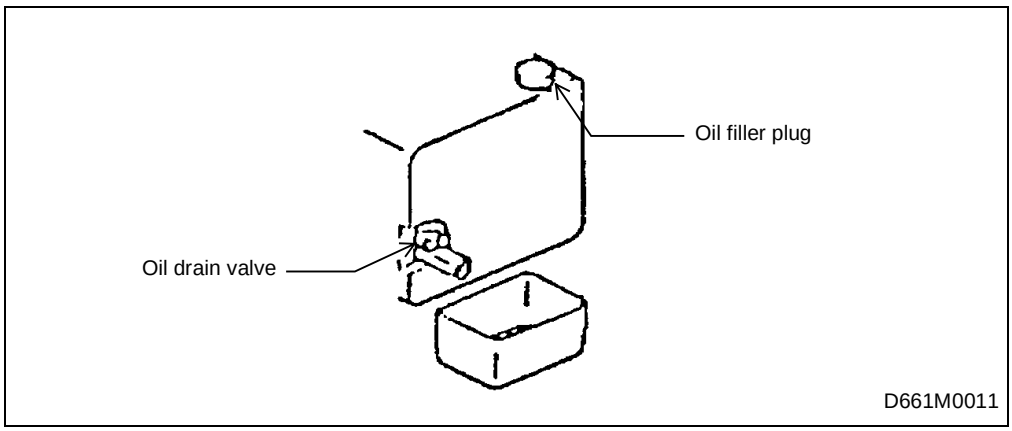


Fig. 7-2 Oil change for the vacuum pump

(6) Remove the oil filler plug.

(7) Open the oil drain valve.

(8) Drain the pump completely of oil. (It takes about 15 minutes.)

(9) Close the oil drain valve, and wipe the oil off the valve with waste cloth.
Fasten the oil drain valve securely to prevent leakage of oil and vacuum.

(10) Remove the exhaust filter.

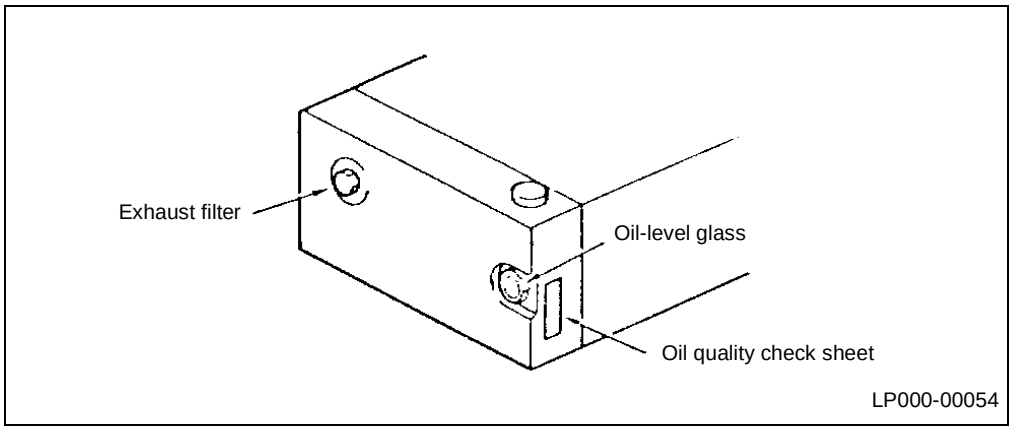


Fig. 7-3 Exhaust filter

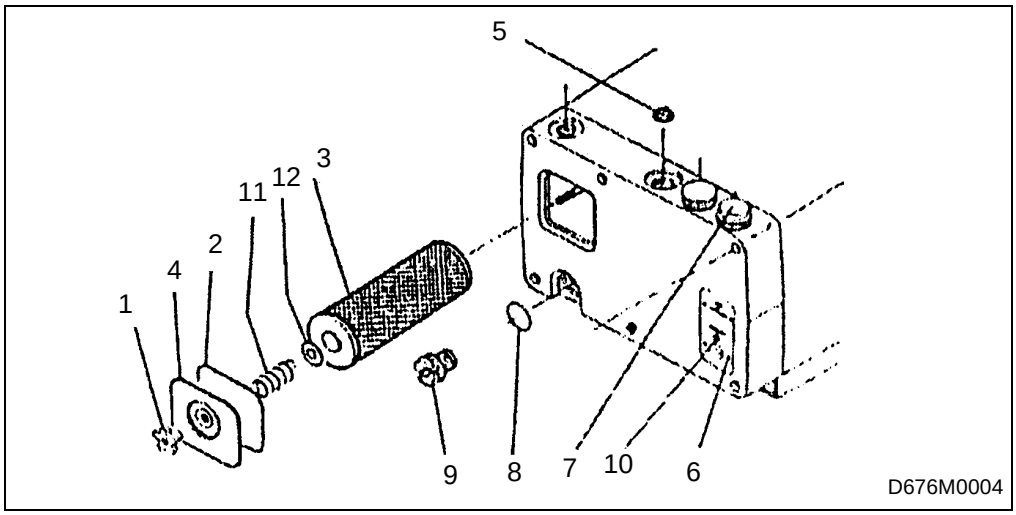


Fig. 7-4 Maintenance of the vacuum pump

No.	Part name	No.	Part name
1	Screw button	7	Oil filler plug
2	O-ring	8	O-ring
3	Exhaust filter element	9	Oil drain plug
4	Filter cover	10	Oiling switch (optional)
5	Dirt trap	11	Spring
6	Oil-level glass	12	Washer

1) Loosen the screw button (No. 1 in Fig. 7-4).
2) Remove the filter cover (No. 4), O-ring (No. 2), spring (No. 11) and washer (No. 12).
3) Pull out and replace the exhaust element (No. 3).

Carry out reassembly in reverse order. Take special care to correctly insert the O-ring.

(11) Clean the exhaust filter with a hand held air nozzle.
Replace the filter if it is clogged or considerably dirty, irrespective of its replacement interval of 4000 hours.

(12) Attach the filter and fasten it securely to prevent leakage of oil and vacuum.

(13) Pour new oil through the oil inlet with an oil jug.
Check the amount at the oil-level glass (up to the top of the central circle).

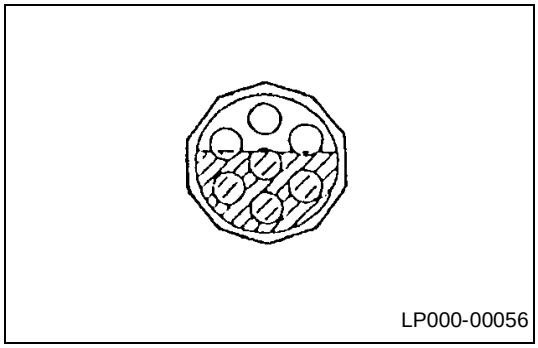


Fig. 7-5 Checking the oil level

(14) Attach the oil filler plug and fasten it securely to prevent leakage of oil and vacuum.
Check in this step the O-ring (P-24) at the inlet for damage (scratches, cracks, cuts, etc.) and replace it as required.

(15) Turn on the main power.

(16) Run the machine for about 10 minutes by the procedure from pressing the POWER **I** button on in order to check the relevant portions (oil drain, oil inlet and exhaust filter) for oil leakage. If there is any leakage, immediately stop the machine and securely tighten the oil filler plug anew.

(17) Switch off the laser operation, and turn off the main power.

(18) Check the oil amount at the oil-level glass and, if required, replenish and drain oil respectively in the same manner as indicated under (13) and (14) above and (1) to (7).

The NC unit must have been turned off, as well as the vacuum pump must have cooled down to the ambient temperature, before replenishment or drainage.

(19) If a considerable contamination of oil is observed, repeat the oil change procedure as required.

(20) Attach the lower cover of the laser power unit to complete the oil change.

7-2 Maintenance of the Mechanical Booster (1.8 kW) and the Turbo Blower (2.5/4.0 kW)

7-2-1 Checking the quality and quantity of oil (every day)

During machine shutdown, check the oil level gauge to make sure that the oil level is between the upper and lower limits. If the oil level is below the danger level, immediately replenish oil to avoid the occurrence of trouble with the turbo blower.

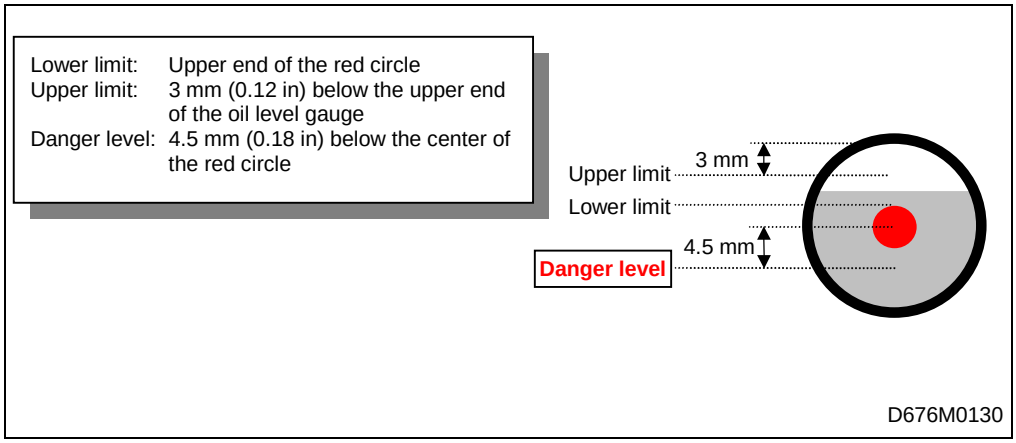

Lower limit: Upper end of the red circle
Upper limit: 3 mm (0.12 in) below the upper end of the oil level gauge
Danger level: 4.5 mm (0.18 in) below the center of the red circle
Upper limit
3 mm
Lower limit
4.5 mm
Danger level
D676M0130

Fig. 7-6 Oil level gauge of the turbo blower

Check the oil level gauge positions referring to Fig. 7-7.

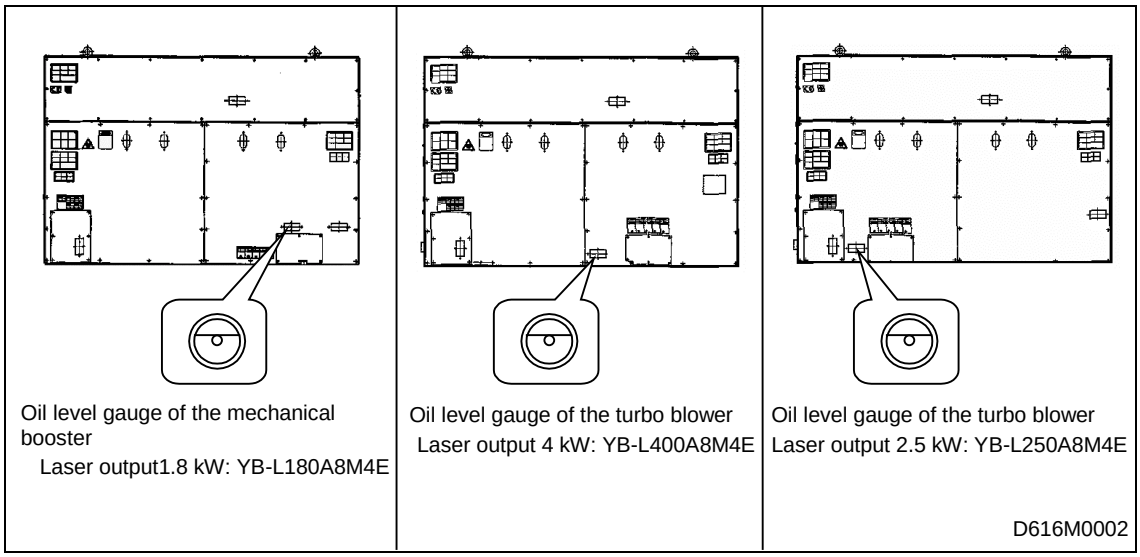

Oil level gauge of the mechanical booster
Laser output1.8 kW: YB-L180A8M4E
Oil level gauge of the turbo blower
Laser output 4 kW: YB-L400A8M4E
Oil level gauge of the turbo blower
Laser output 2.5 kW: YB-L250A8M4E
D616M0002

Fig. 7-7 Checking the quantity of oil

7-2-2 Procedure for lubricating the turbo blower (2.5/4.0 kW)

The oscillator is provided with maintenance covers (panel K2 and K3), as shown in Fig. 7-8 below. Removing these covers allows you to perform lubrication of the oscillator.

WARNING

- Do not remove the maintenance cover for any purposes other than maintenance.
- Before removing the maintenance cover, always set the main power breaker to OFF and lock it.
- Never turn on the main power before attaching the maintenance covers. Failure to observe this could cause you to have a serious accident.

1. Requirements

- Hexagon key for 5 mm across flats
- Oil funnel (Accessory)
- Sleeve 6 mm in diameter (1 piece, accessory)
- Oil
  4 kW (Model: YB-L400A8M4E): 0.8 L, or 0.028 ft^3, of Aeroshell Turbine 560
  2.5 kW(Model: YB-L250A8M4E): 0.68 L, or 0.024 ft^3, of Aeroshell Turbine 560
- Wrench for 12 mm across flats
- Waste cloth
- Cutting knife

A. Lubrication procedure

(1) Switch off the laser operation.

(2) Set the main power breaker to OFF.

(3) Allow a cooling time of at least 30 minutes before proceeding with the lubrication.

(4) Open the panel (K2 or K3) (**Note**).

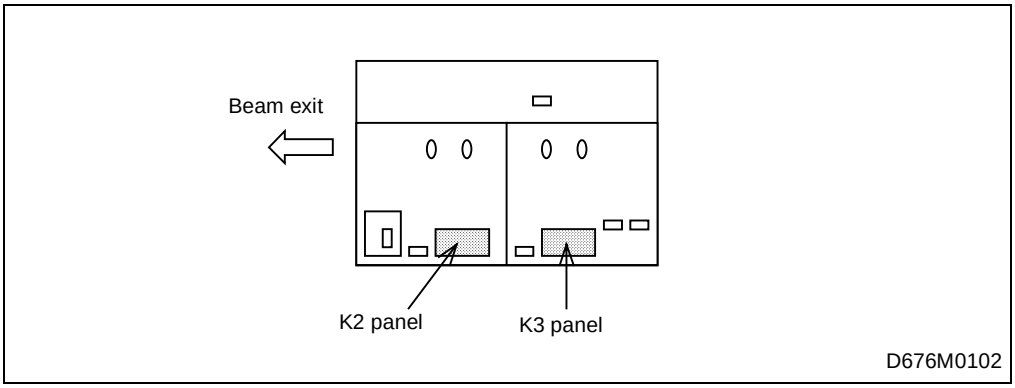


Fig. 7-8

Note: The panel type differs according to the oscillator.

Oscillator	Panel
2.5 kW (Type: YB-L250A8M4E)	K2
4 kW (Type: YB-L400A8M4E)	K3

(5) Release the vacuum pressure through the open/close hole of the panel.

CAUTION

- Releasing the vacuum pressure refers to returning the internal vacuum system of the oscillator from its normal vacuum status to an atmospheric pressure. Oscillator damage may result if this operation is not performed as directed below. Proceed in strict accordance with the directions.

First, loosen the cap nut on the vacuum release section (having a connected hose 6 mm or 0.24 in in diameter and 4 m or 13 ft long) using a wrench, and remove the hose. Next after removing the hose, leave the vacuum system intact for at least about 15 minutes.

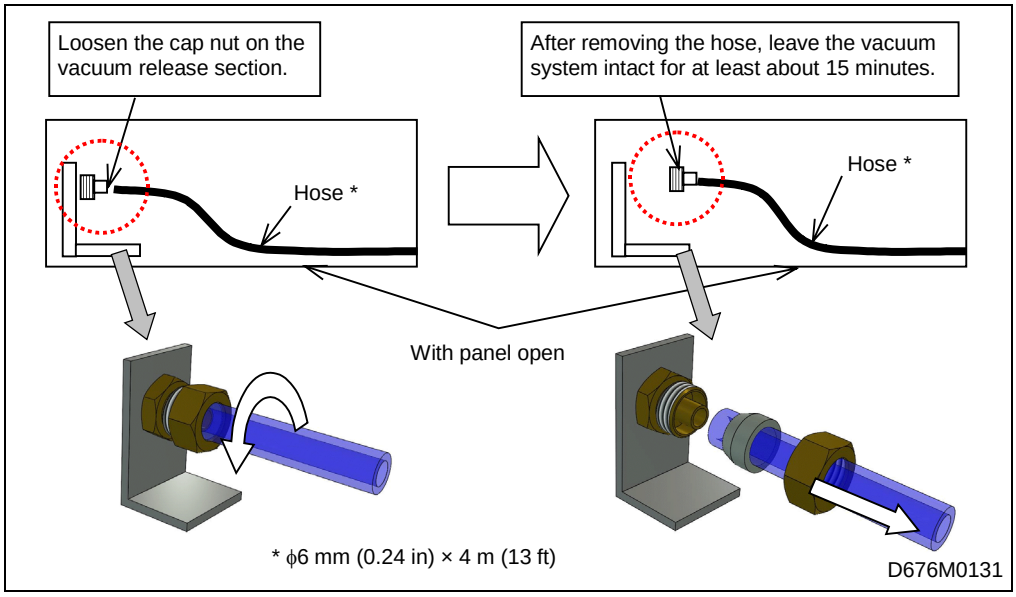

Loosen the cap nut on the vacuum release section.
After removing the hose, leave the vacuum system intact for at least about 15 minutes.
Hose *
Hose *
With panel open
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0131

Fig. 7-9

Note: When disconnecting the hose, be careful not to allow dust to enter the hose.

(6) Disconnect the lubrication hose (12 mm or 0.47 in in diameter and 9 m or 30 ft long) from the fixing bracket.

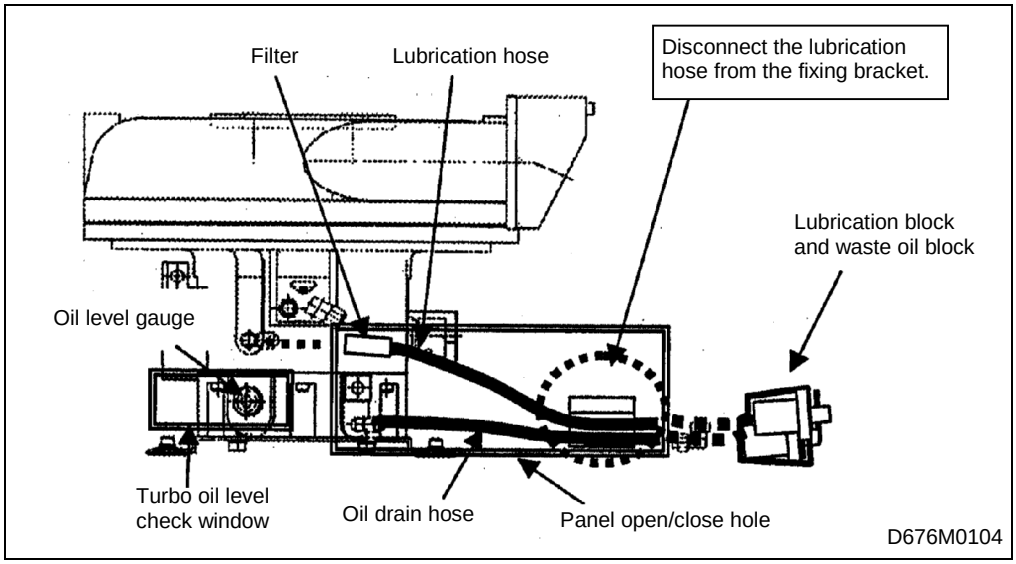


Fig. 7-10

(7) Pull the lubrication block out to the front, and lift it off from the open/close hole of the panel.

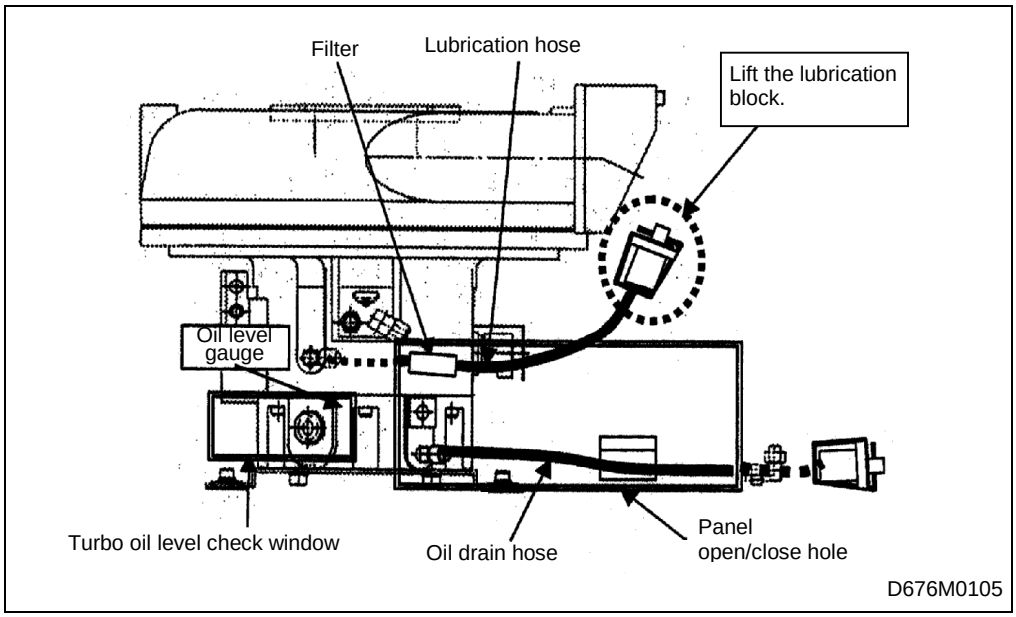


Fig. 7-11

(8) Remove the lid of the lubrication block.

CAUTION

- Before unlidding the lubrication block, make sure that a time of at least about 15 minutes has passed since the vacuum pressure was released. If the lubrication block is unlidded before the vacuum release is completed, the oscillator may be damaged by the possible flow of the turbo blower oil into the vacuum system of the oscillator. Be sure to perform the above confirmation.

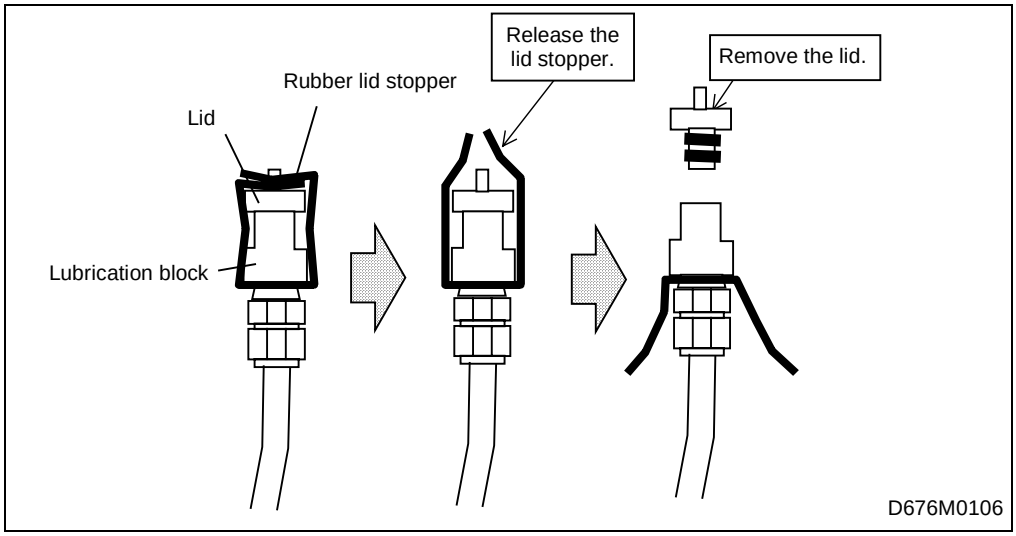


Fig. 7-12

Note: At this step, see to it that no dust sticks to the lid of the oiling port or to the O-ring or enters the oiling hose; otherwise vacuum leakage will result.

(9) Insert the bottom end of the funnel into the lubrication block.

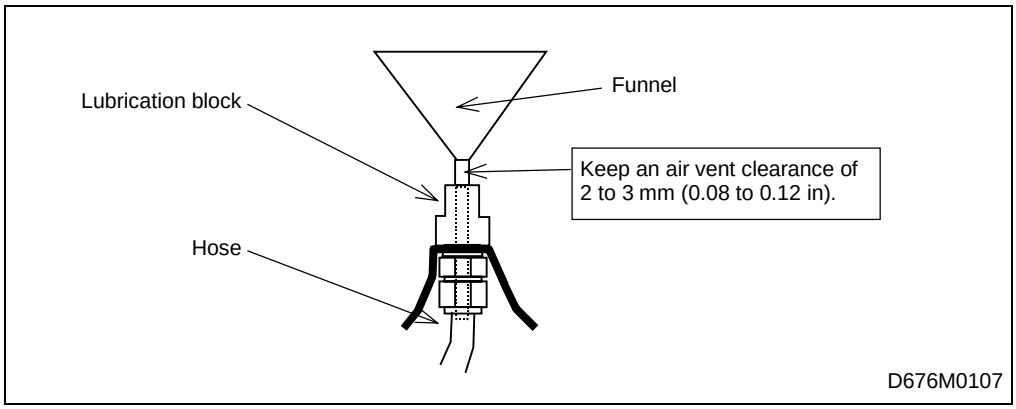


Fig. 7-13

(10) Observing the oil level gauge, replenish oil for a level between the upper and lower limits.

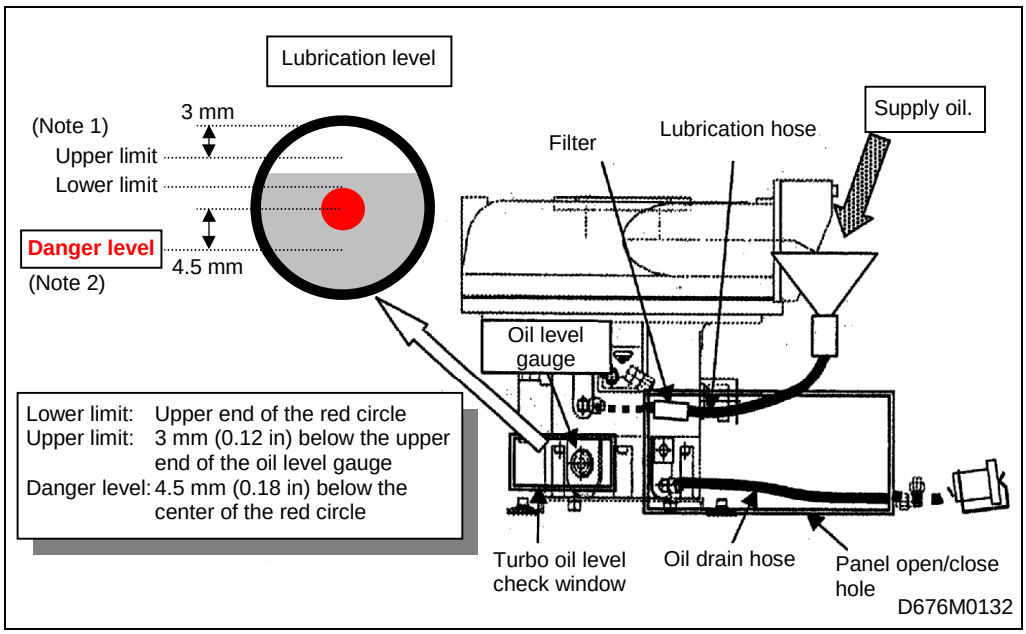


Fig. 7-14

Note 1: Be sure to replenish oil for a level between the upper and lower limits. Excessive replenishment may result in trouble with the turbo blower.

Note 2: If the oil level is below the danger level, immediately replenish oil to avoid the occurrence of trouble with the turbo blower.

(11) Remove the funnel from the lubrication block, and mount the lid on the block (do not forget mounting the lid stopper).

CAUTION

- The oscillator, if operated with the lubrication block unlidded, may be damaged by the possible flow of the turbo blower oil into the vacuum system of the oscillator. Therefore, be sure to mount the lid.
- Before mounting the lid on the lubrication block, remove dirt from the side of the lid (especially, the O-rings) and the inside of the lubrication block. Dirt between the lid and the lubrication block may allow the vacuum pressure to leak from that section and oscillator damage could result.

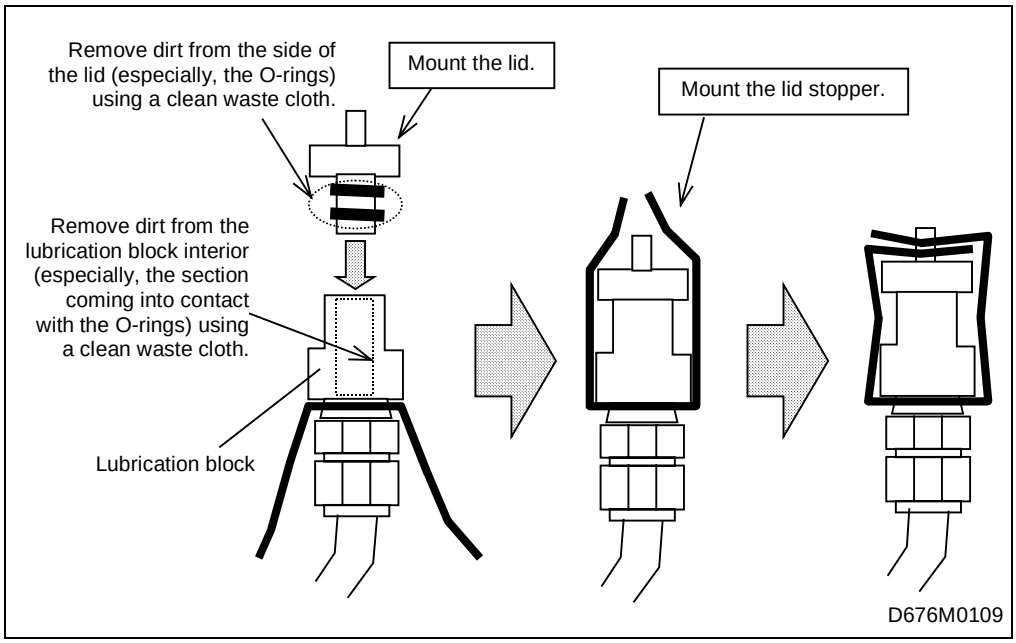

Remove dirt from the side of the lid (especially, the O-rings) using a clean waste cloth.
Mount the lid.
Mount the lid stopper.
Remove dirt from the lubrication block interior (especially, the section coming into contact with the O-rings) using a clean waste cloth.
Lubrication block
D676M0109

Fig. 7-15

(12) Replace the lubrication hose (12 mm or 0.47 in in diameter and 9 m or 30 ft long) in the fixing bracket.

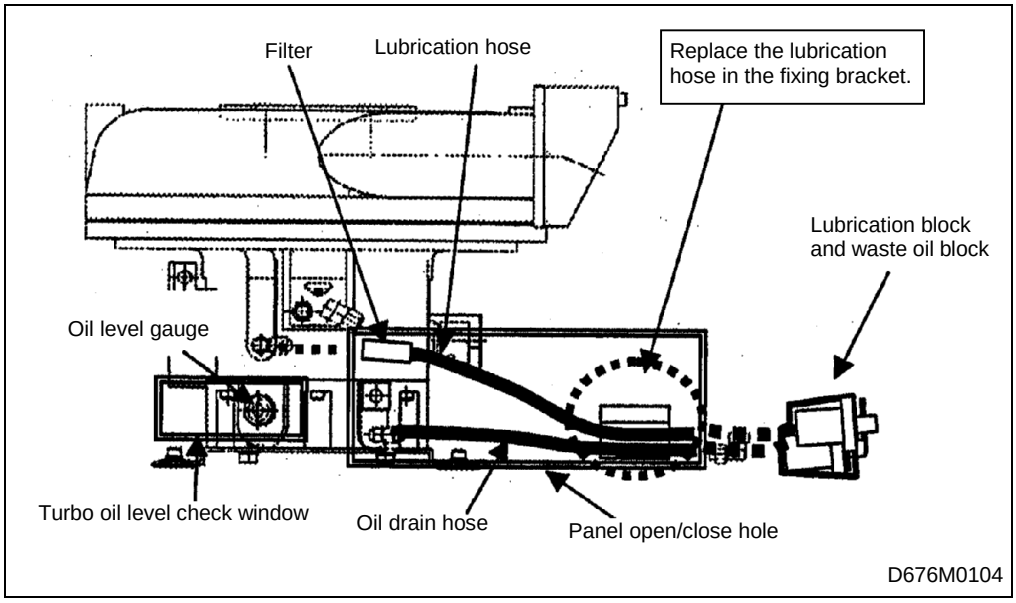


Fig. 7-16

(13) Reconnect the hose (ϕ6 mm [0.24 in] × 4 m [13 ft]) on the vacuum release section. At this step, after cutting at least 20 mm (0.79 in) of the hose leading end, connect a new sleeve to the hose and then reconnect the sleeve-fitted hose itself using a reverse procedure to that of disconnection.
(Do not reuse the fastened old hose section and sleeve once they have been removed. The reuse of these sections causes the vacuum pressure to leak.)

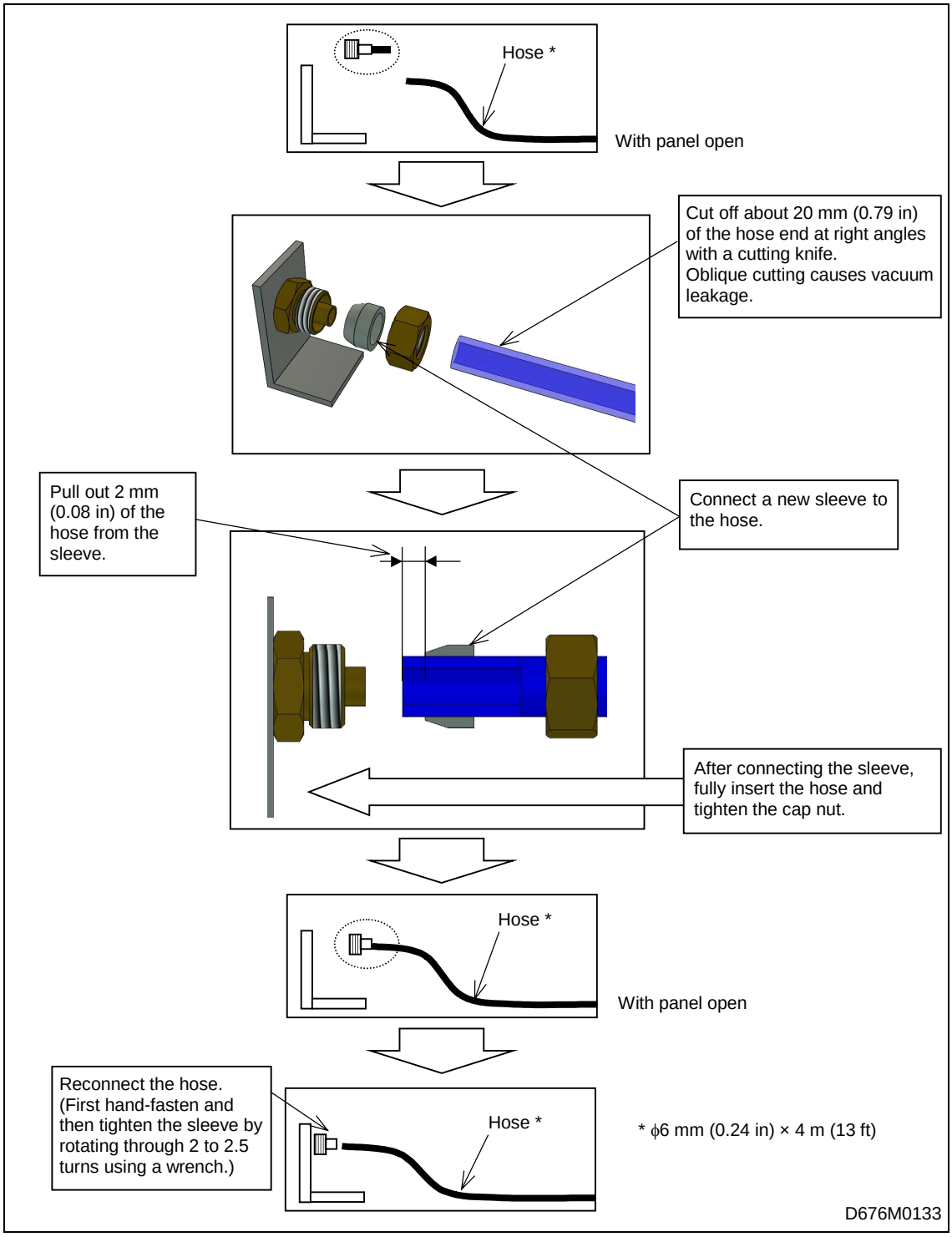

Hose *
With panel open
Cut off about 20 mm (0.79 in) of the hose end at right angles with a cutting knife.
Oblique cutting causes vacuum leakage.
Pull out 2 mm (0.08 in) of the hose from the sleeve.
Connect a new sleeve to the hose.
After connecting the sleeve, fully insert the hose and tighten the cap nut.
Hose *
With panel open
Reconnect the hose. (First hand-fasten and then tighten the sleeve by rotating through 2 to 2.5 turns using a wrench.)
Hose *
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0133

Fig. 7-17

(14) Mount the removed panel.

7-2-3 Procedure for lubricating the mechanical booster (1.8 kW)

Two methods are available to lubricate the PMB006C mechanical booster.

No.	Method of lubrication	Lubrication timing	Lubricating person
1	Gear oil lubrication	- After installation or relocation - During periodic oil replacement (2000 hours of operation or 1 year, whichever comes first)	User or trained service engineer
2	Mechanical seal lubrication	Although this lubricating operation is not required under normal operating conditions, if the pump remains in its stopped status for at least three months or if the laser oscillator is relocated, be sure to lubricate the mechanical seal.	Trained service engineer

1. Gear lubrication procedure

The oscillator is provided with a maintenance cover (panel K4), as shown in Fig. 7-18 below. Removing this cover allows you to perform lubrication of the oscillator.

WARNING

- Do not remove the maintenance cover for any purposes other than maintenance.
- Before removing the maintenance cover, always set the main power breaker to OFF and lock it.
- Never turn on the main power before attaching the maintenance covers. Failure to observe this could cause you to have a serious accident.

A. Requirements

- Hexagon key for 5 mm across flats
- Oil funnel (Accessory)
- Sleeve 6 mm in diameter (1 piece, accessory)
- Oil: 2.0 L, or 0.071 ft^3, of ULVAC R-4
- Oil pan
- Wrench for 12 mm across flats
- Waste cloth
- Cutting knife

B. Lubrication procedure

(1) Switch off the laser operation.

(2) Set the main power breaker to OFF.

(3) Allow a cooling time of at least 30 minutes before proceeding with the lubrication.

(4) Open the K4 panel.

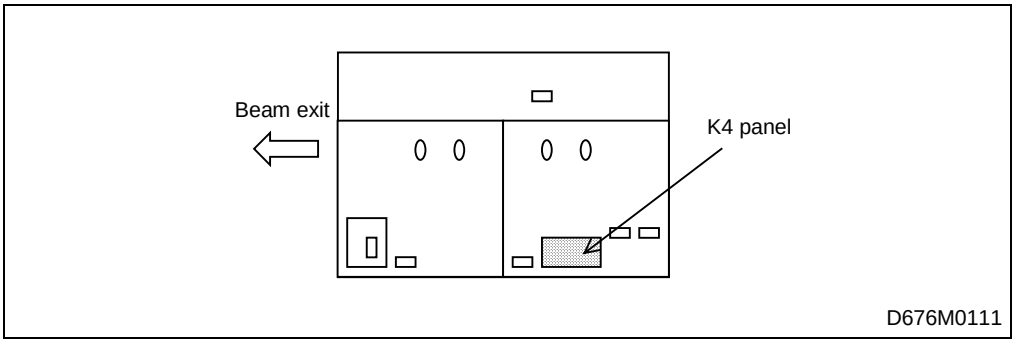


Fig. 7-18

(5) Release the vacuum pressure through the open/close hole of the K4 panel.

CAUTION

- Releasing the vacuum pressure refers to returning the internal vacuum system of the oscillator from its normal vacuum status to an atmospheric pressure. Oscillator damage may result if this operation is not performed as directed below. Proceed in strict accordance with the directions.

First, loosen the cap nut on the vacuum release section (having a connected hose 6 mm or 0.24 in in diameter and 4 m or 13 ft long) using a wrench, and remove the hose. Next after removing the hose, leave the vacuum system intact for at least about 15 minutes.

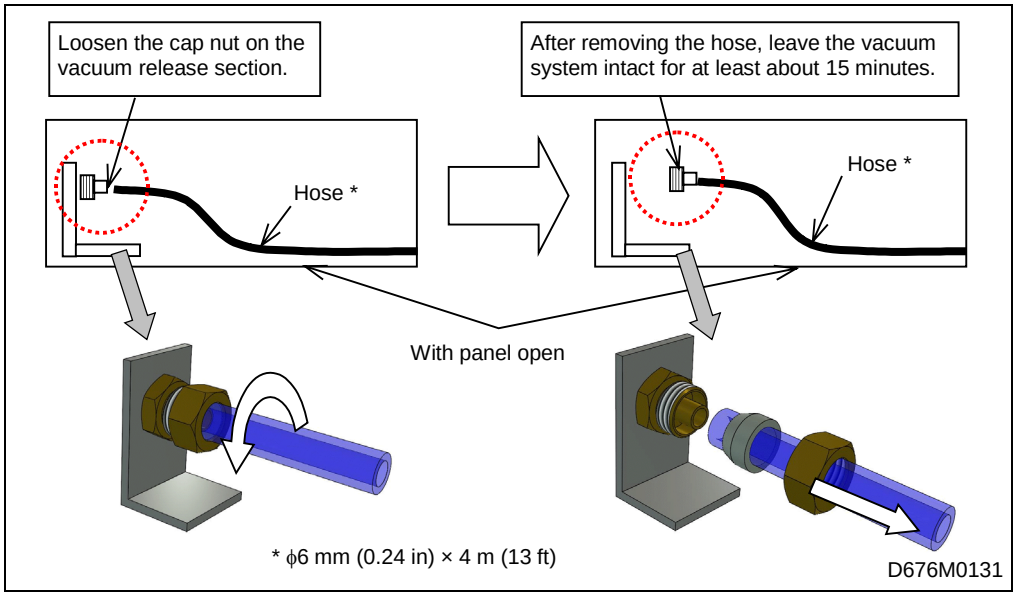

Loosen the cap nut on the vacuum release section.
After removing the hose, leave the vacuum system intact for at least about 15 minutes.
Hose *
Hose *
With panel open
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0131

Fig. 7-19

Note: When disconnecting the hose, be careful not to allow dust to enter the hose.

(6) Disconnect the lubrication hose (12 mm or 0.47 in in diameter and 9 m or 30 ft long) from the fixing bracket.

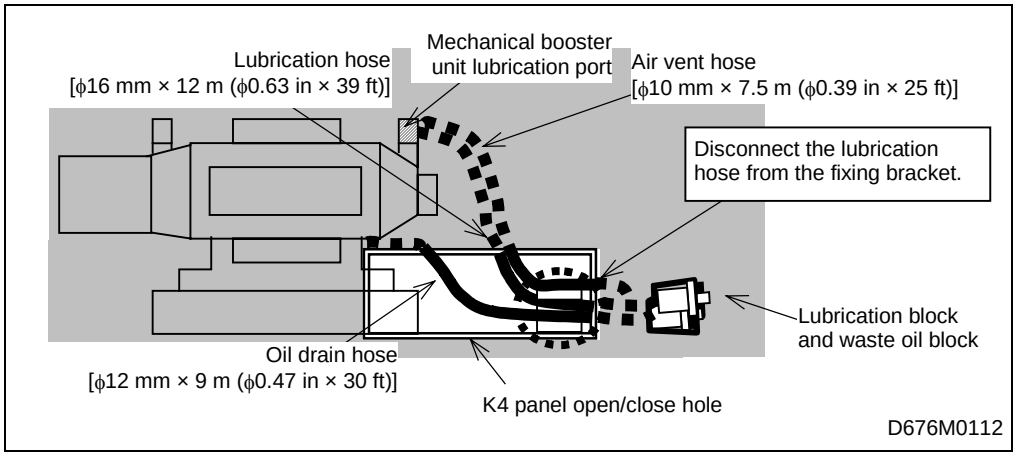

Lubrication hose
[ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Mechanical booster unit lubrication port
Air vent hose
[ϕ10 mm × 7.5 m (ϕ0.39 in × 25 ft)]
Disconnect the lubrication hose from the fixing bracket.
Lubrication block and waste oil block
Oil drain hose
[ϕ12 mm × 9 m (ϕ0.47 in × 30 ft)]
K4 panel open/close hole
D676M0112

Fig. 7-20

(7) Pull the lubrication block out to the front, and lift it off from the open/close hole of the K4 panel. At this time, lift the block to a level above the lubrication port of the mechanical booster unit as shown in the view below.

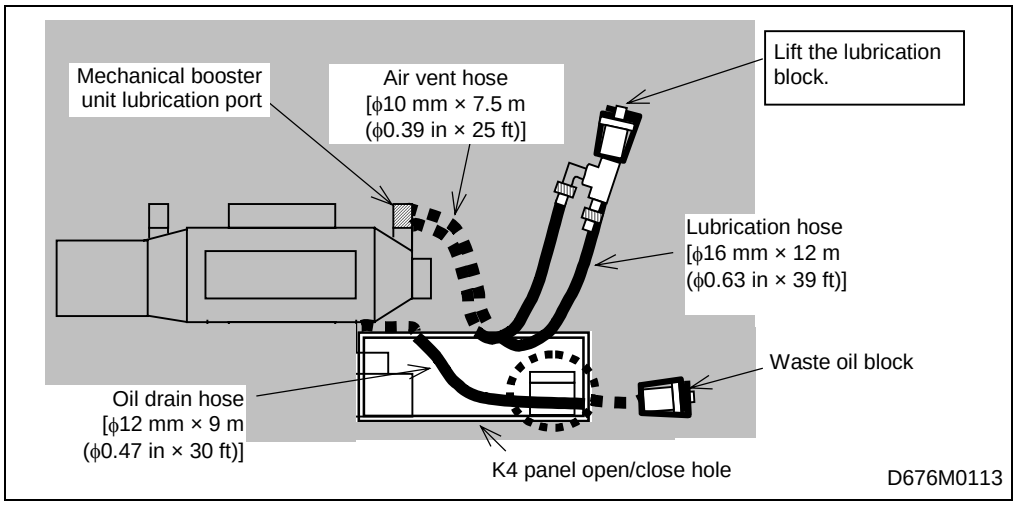

Mechanical booster unit lubrication port
Air vent hose [ϕ10 mm × 7.5 m (ϕ0.39 in × 25 ft)]
Lift the lubrication block.
Lubrication hose [ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Waste oil block
Oil drain hose [ϕ12 mm × 9 m (ϕ0.47 in × 30 ft)]
K4 panel open/close hole
D676M0113

Fig. 7-21

(8) Remove the lid of the lubrication block.

CAUTION

- Before unlidding the lubrication block, make sure that a time of at least about 15 minutes has passed since the vacuum pressure was released. If the lubrication block is unlidded before the vacuum release is completed, the oscillator may be damaged by the possible flow of the mechanical booster oil into the vacuum system of the oscillator. Be sure to perform the above confirmation.

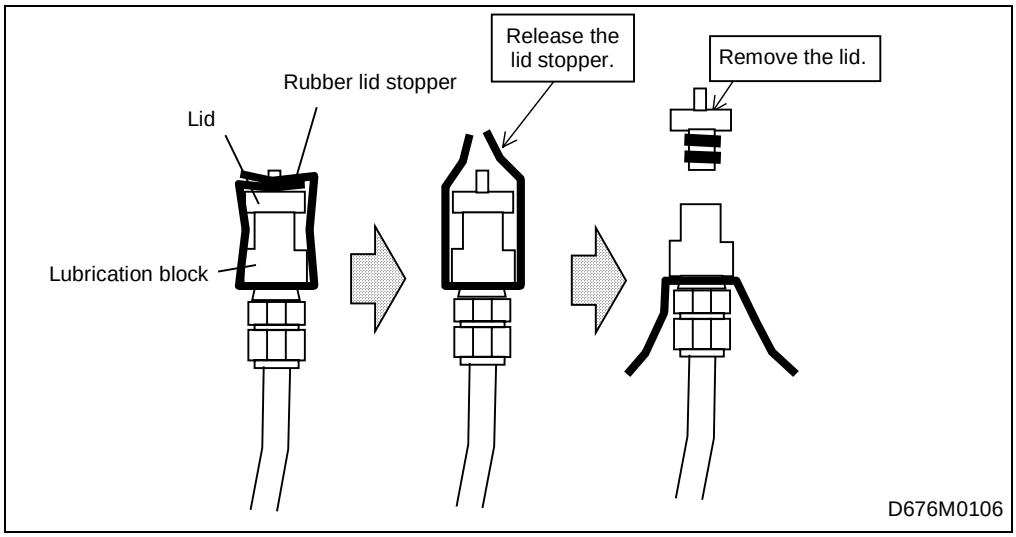


Fig. 7-22

Note: At this step, see to it that no dust sticks to the lid of the oiling port or to the O-ring or enters the oiling hose; otherwise vacuum leakage will result.

(9) Before starting the lubrication, drain the oil from the air vent hose (10 mm or 0.39 in in diameter and 7.5 m or 25 ft long). If oil is left inside the air vent hose, the air inside cannot be completely discharged and the lubrication normally completed within 5 - 10 minutes may require 60 minutes or more.

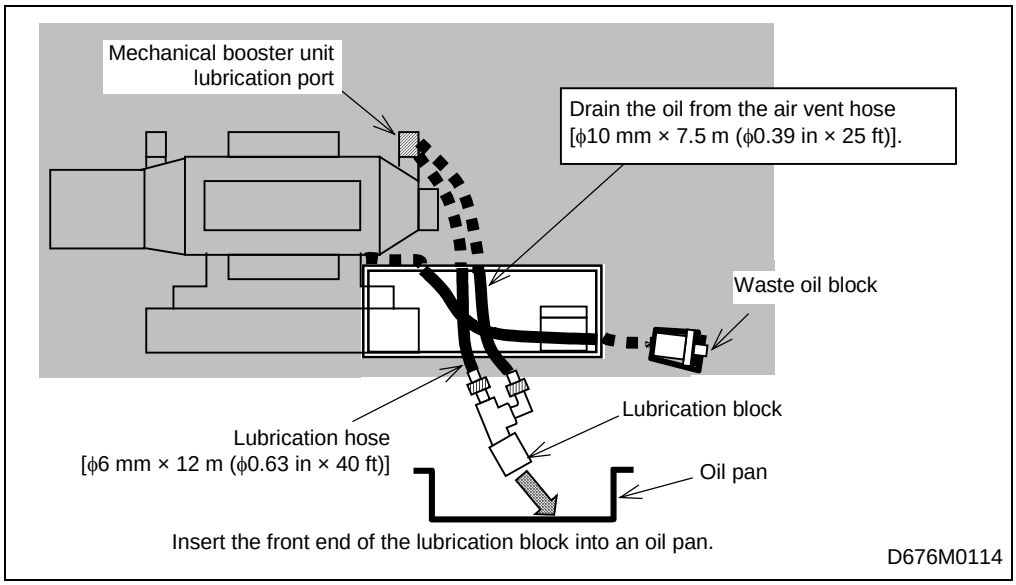

Mechanical booster unit lubrication port
Drain the oil from the air vent hose [ϕ10 mm × 7.5 m (ϕ0.39 in × 25 ft)].
Waste oil block
Lubrication block
Lubrication hose [ϕ6 mm × 12 m (ϕ0.63 in × 40 ft)]
Oil pan
Insert the front end of the lubrication block into an oil pan.
D676M0114

Fig. 7-23

(10) Remove the lubrication block by pulling it to the front, then lift it to a level above the lubrication port of the mechanical booster unit, and set a funnel at the top of the lubrication hose.

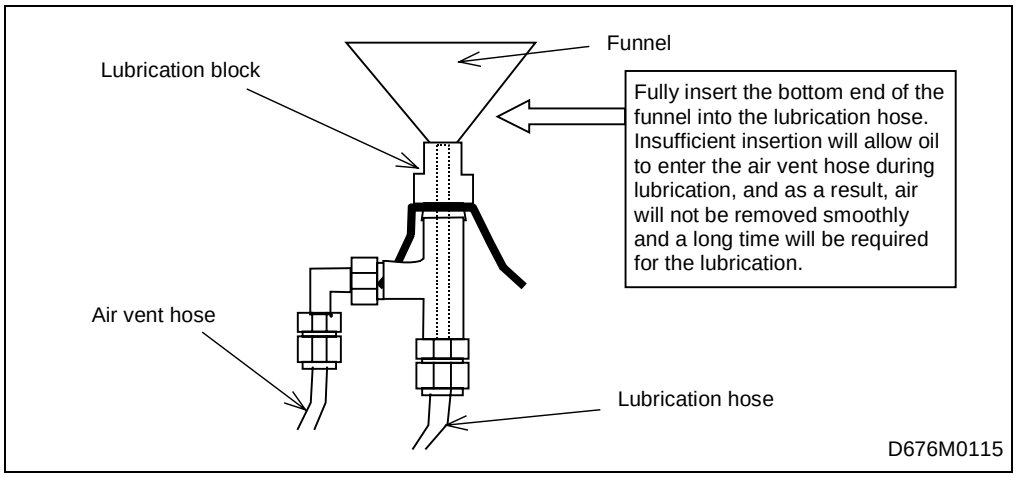

Funnel
Lubrication block
Fully insert the bottom end of the funnel into the lubrication hose. Insufficient insertion will allow oil to enter the air vent hose during lubrication, and as a result, air will not be removed smoothly and a long time will be required for the lubrication.
Air vent hose
Lubrication hose
D676M0115

Fig. 7-24

(11) Supply oil from the funnel until the oil level gauge of the mechanical booster has indicated a level between the maximum and minimum allowable level marks.

Note: It takes about one minute for the supplied oil to pervade the entire interior of the mechanical booster. After the oil has been supplied up to the appropriate level, since the oil level may decrease, check it about one minute after the lubrication. Add oil if the oil level has decreased.

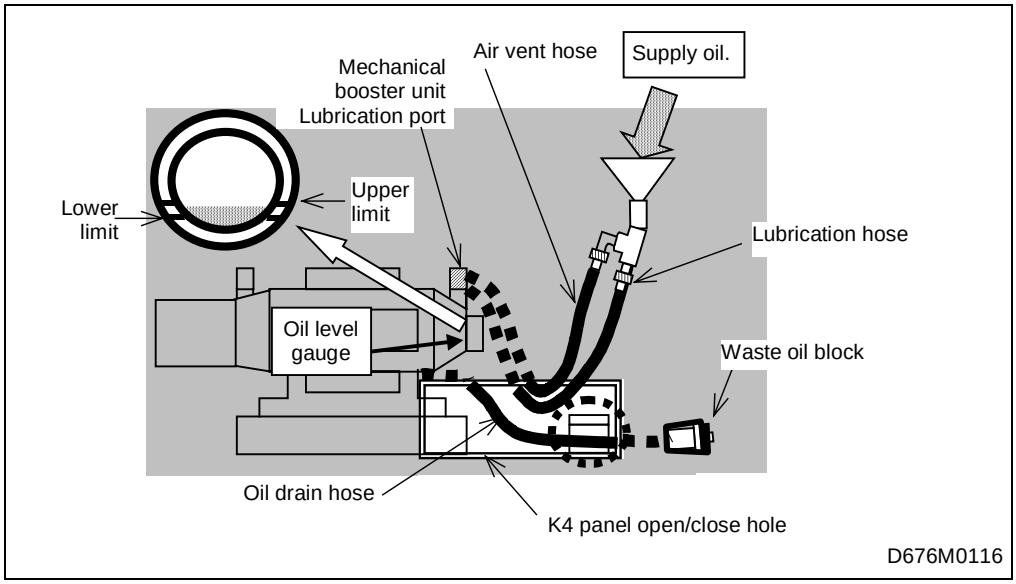


Fig. 7-25

(12) Remove the funnel from the lubrication block, and mount the lid on the block (do not forget mounting the lid stopper). A slight amount of oil is usually left inside the lubrication hose. Since moving the lubrication block downward will cause the oil to flow out, lift the block and mount the lid under that state.

CAUTION

- The oscillator, if operated with the lubrication block unlidded, may be damaged by the possible flow of the mechanical booster oil into the vacuum system of the oscillator. Therefore, be sure to mount the lid.
- Before mounting the lid on the lubrication block, remove dirt from the side of the lid (especially, the O-rings) and the inside of the lubrication block. Dirt between the lid and the lubrication block may allow the vacuum pressure to leak from that section and oscillator damage could result.

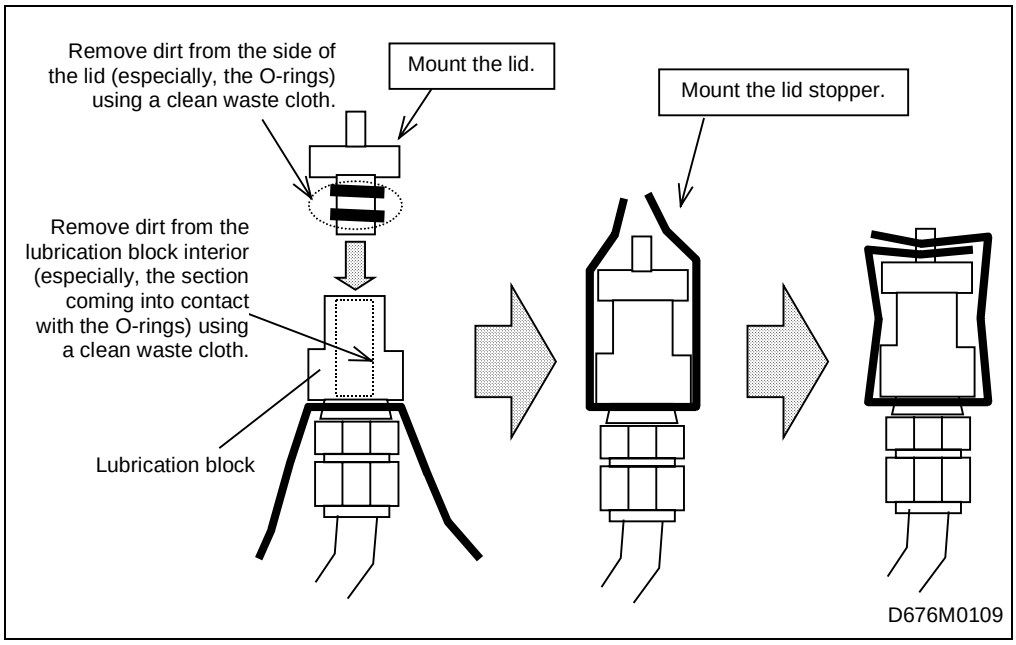

Remove dirt from the side of the lid (especially, the O-rings) using a clean waste cloth.
Mount the lid.
Mount the lid stopper.
Remove dirt from the lubrication block interior (especially, the section coming into contact with the O-rings) using a clean waste cloth.
Lubrication block
D676M0109

Fig. 7-26

(13) Replace the lubrication hose (16 mm or 0.63 in in diameter and 12 m or 40 ft long) and the air vent hose (10 mm or 0.39 in in diameter and 7.5 m or 25 ft long) in the fixing bracket.

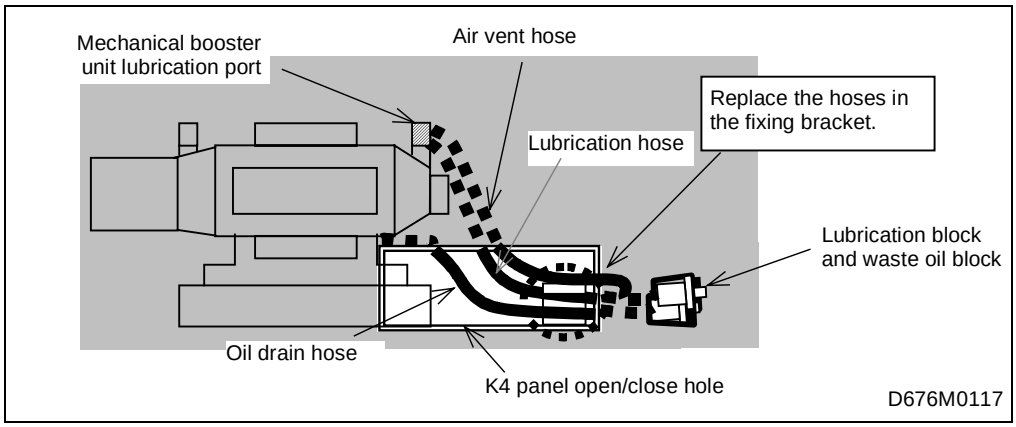


Fig. 7-27

(14) Remount the vacuum release plug. At this time, after cutting at least 20 mm (0.79 in) of the hose leading end, connect a new sleeve to the hose and then reconnect the sleeve-fitted hose itself using a reverse procedure to that of disconnection.

Note: Do not reuse the fastened old hose section and sleeve once they have been removed. The reuse of these sections causes the vacuum pressure to leak.

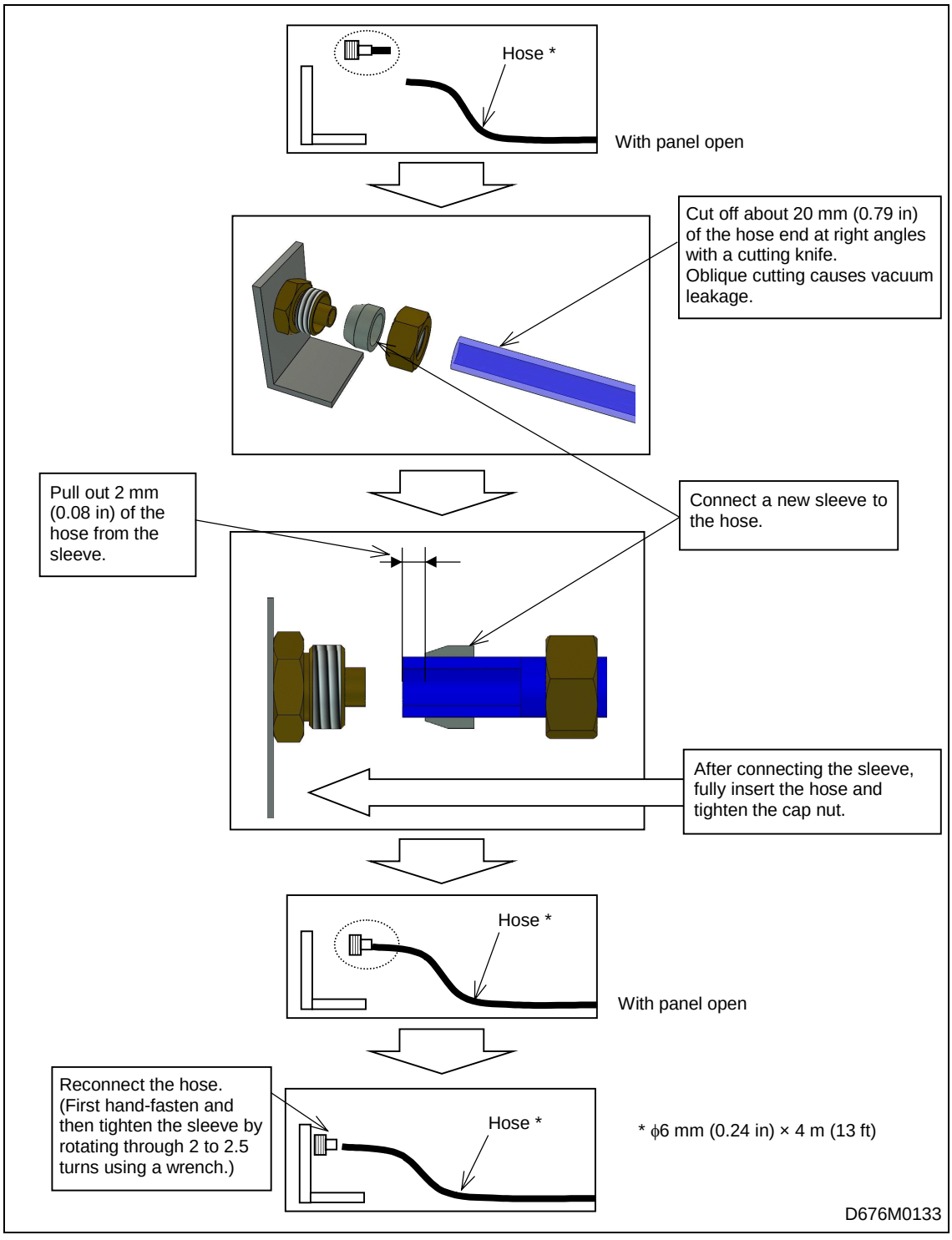

Hose *
With panel open
Cut off about 20 mm (0.79 in) of the hose end at right angles with a cutting knife.
Oblique cutting causes vacuum leakage.
Pull out 2 mm (0.08 in) of the hose from the sleeve.
Connect a new sleeve to the hose.
After connecting the sleeve, fully insert the hose and tighten the cap nut.
Hose *
With panel open
Reconnect the hose. (First hand-fasten and then tighten the sleeve by rotating through 2 to 2.5 turns using a wrench.)
Hose *
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0133

Fig. 7-28

(15) Mount the removed panel.

7-2-4 Procedure for changing the turbo blower oil (2.5/4.0 kW)

The oscillator is provided with maintenance covers (panel K2 and K3), as shown in Fig. 7-29 below. Removing these covers allows you to perform lubrication of the oscillator.

WARNING

- Do not remove the maintenance cover for any purposes other than maintenance.
- Before removing the maintenance cover, always set the main power breaker to OFF and lock it.
- Never turn on the main power before attaching the maintenance covers. Failure to observe this could cause you to have a serious accident.

1. Requirements

- Hexagon key for 5 mm across flats
- Oil funnel (Accessory)
- Sleeve 6 mm in diameter (1 piece, accessory)
- Oil
  4 kW (Model: YB-L400A8M7E): 0.8 L, or 0.028 ft^3, of Aeroshell Turbine 560
  2.5 kW(Model: YB-L250A8M7E): 0.68 L, or 0.024 ft^3, of Aeroshell Turbine 560
- Oil pan, with a capacity of 3 L or 0.106 ft^3
- Wrench for 12 mm across flats
- Waste cloth
- Cutting knife

2. Oil changing procedure

(1) Switch off the laser operation.

(2) Set the main power breaker to OFF.

(3) Allow a cooling time of at least 30 minutes before proceeding with oil change.

(4) Open the panel (K2 or K3) (**Note**).

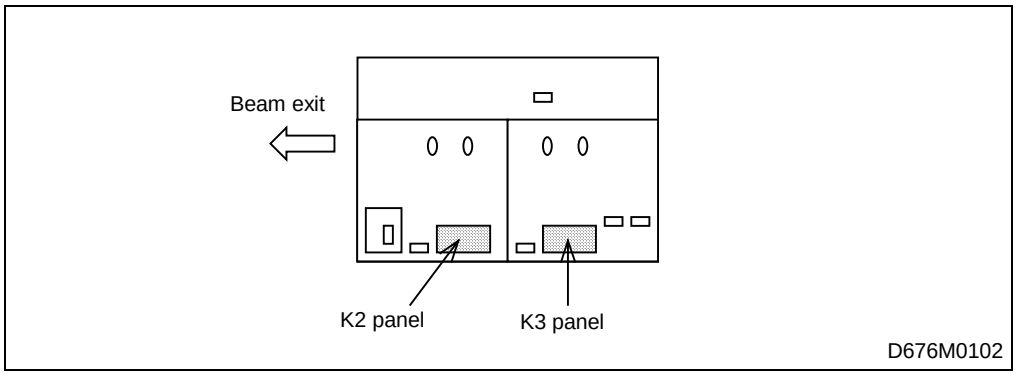


Fig. 7-29

Note: The panel type differs according to the oscillator.

Oscillator	Panel
2.5 kW (Type: YB-L250A8M7E)	K2
4 kW (Type: YB-L400A8M7E)	K3

(5) Release the vacuum pressure through the open/close hole of the panel.

CAUTION

- Releasing the vacuum pressure refers to returning the internal vacuum system of the oscillator from its normal vacuum status to an atmospheric pressure. Oscillator damage may result if this operation is not performed as directed below. Proceed in strict accordance with the directions.

First, loosen the cap nut on the vacuum release section (having a connected hose 6 mm or 0.24 in in diameter and 4 m or 13 ft long) using a wrench, and remove the hose. Next after removing the hose, leave the vacuum system intact for at least about 15 minutes.

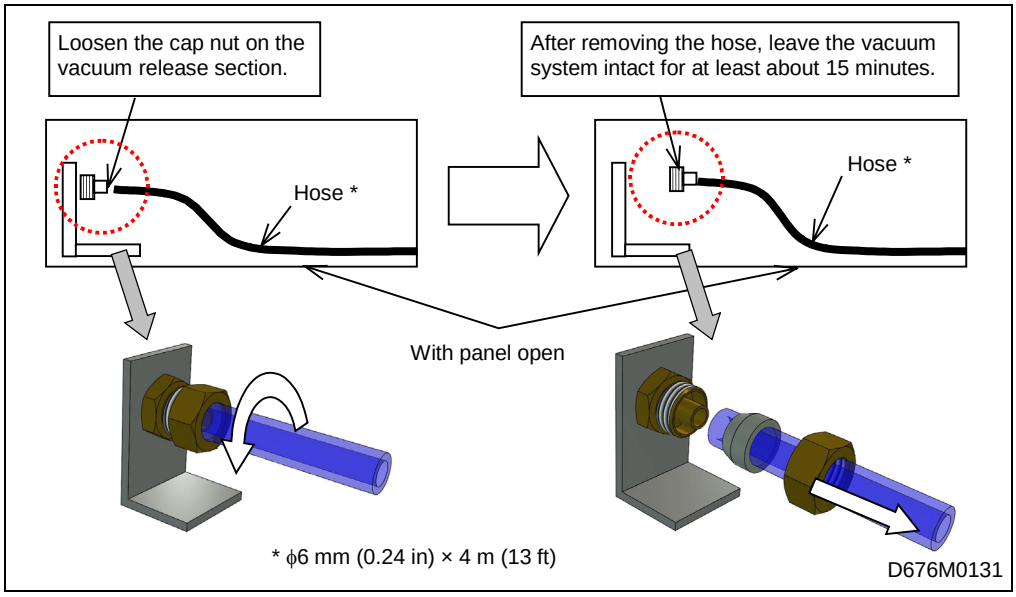

Loosen the cap nut on the vacuum release section.
After removing the hose, leave the vacuum system intact for at least about 15 minutes.
Hose *
Hose *
With panel open
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0131

Fig. 7-30

Note: When disconnecting the hose, be careful not to allow dust to enter the hose.

(6) Disconnect the lubrication hose and the oil drain hose (12 mm or 0.47 in in diameter and 9 m or 30 ft long) from the fixing bracket.

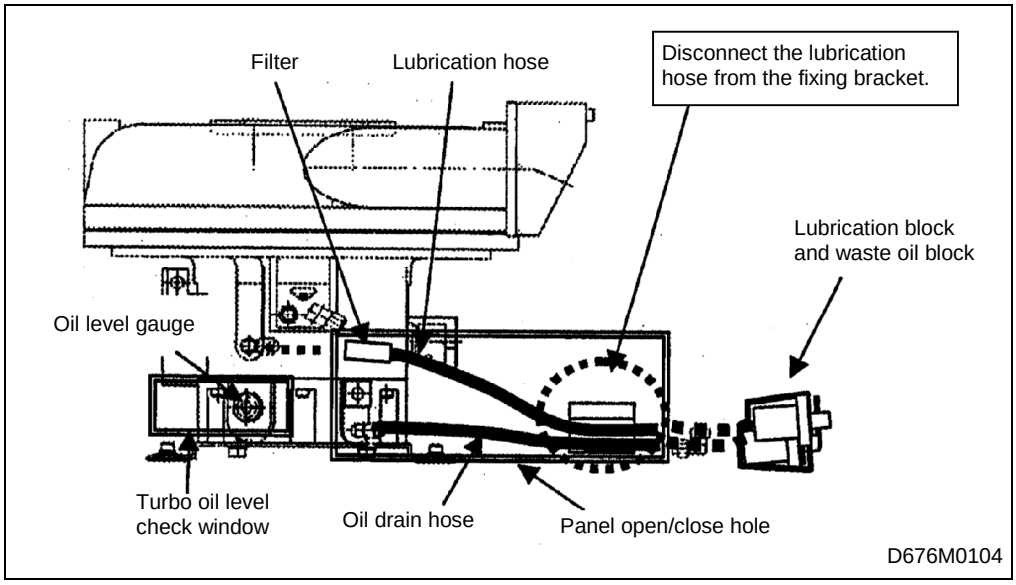


Fig. 7-31

(7) Pull the lubrication block and the waste oil block out to the front from the open/close hole of the panel.

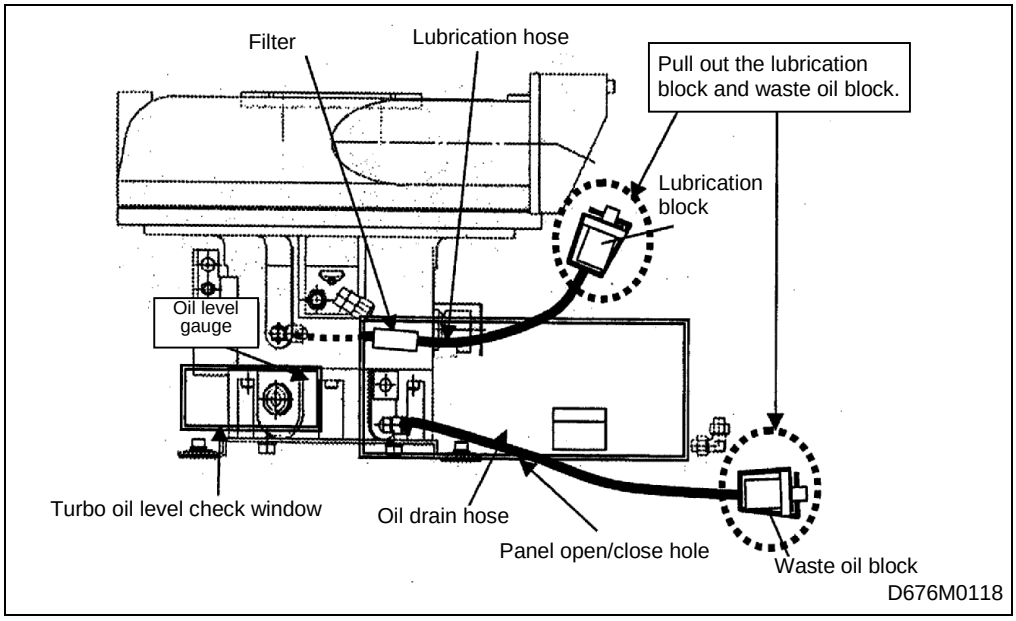


Fig. 7-32

(8) Insert the front end of the waste oil block into an oil pan with a capacity of 2 to 3 L (0.071 to 0.106 ft^3).

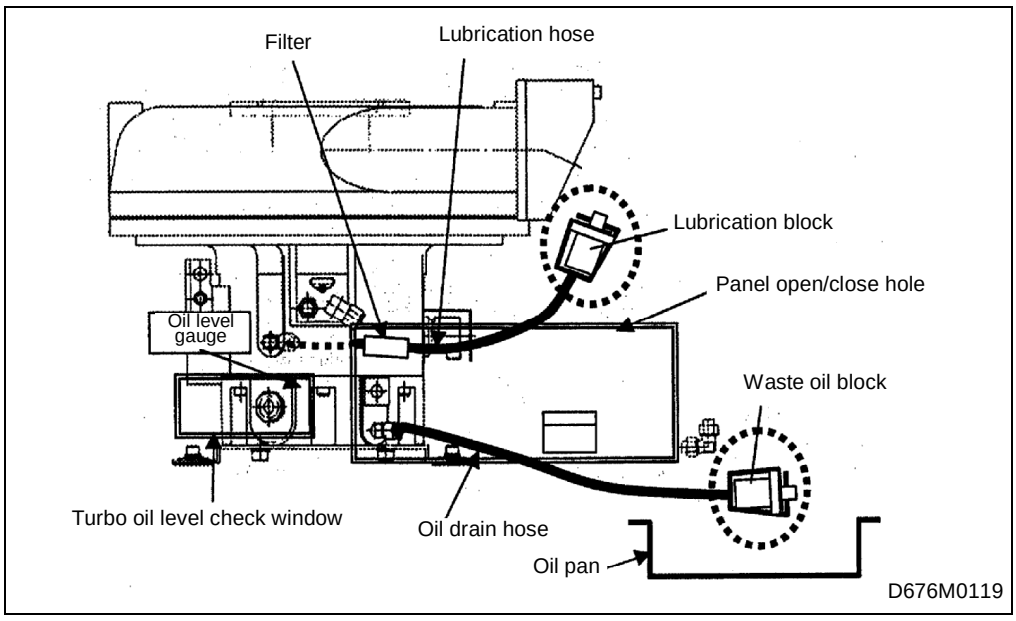


Fig. 7-33

(9) Remove the lids from both the waste oil block and the lubrication block.

CAUTION

- Before unlidding the lubrication block, make sure that a time of at least about 15 minutes has passed since the vacuum pressure was released. If the lubrication block is unlidded before the vacuum release is completed, the oscillator may be damaged by the possible flow of the turbo blower oil into the vacuum system of the oscillator. Be sure to perform the above confirmation.

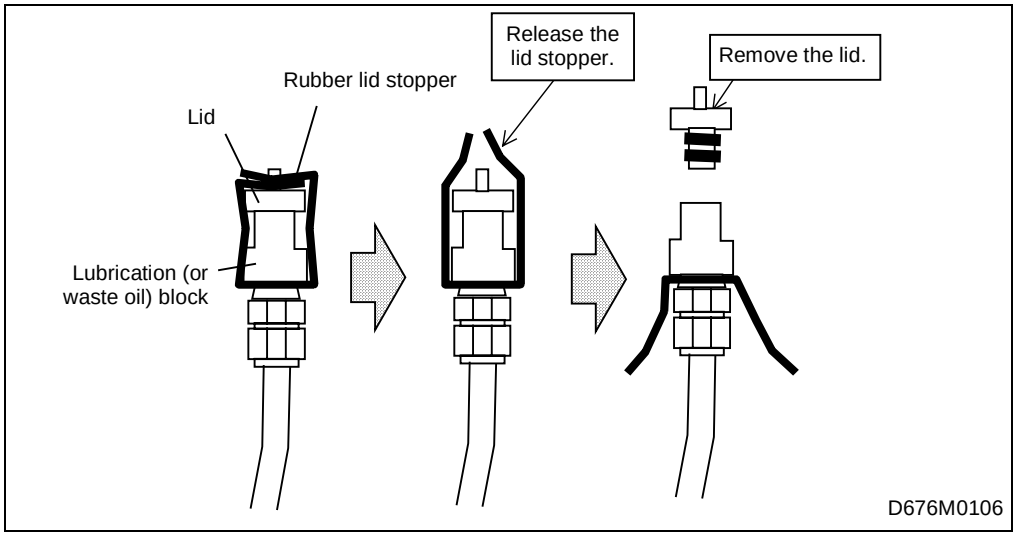


Fig. 7-34

Note: At this step, see to it that no dust sticks to the lid of the oiling port or to the O-ring or enters the oiling hose; otherwise vacuum leakage will result.

Unlidding the block allows the oil to flow out. Receive it using an oil pan. If the oil does not flow out smoothly, lightly tap the filter section.

Note: The likely formation of an oil film inside the filter may prevent air bleeding and if this actually happens, the oil discharge rate may extremely decrease or the discharge itself may stop halfway. In that case, temporarily supply about 100 to 200 mL (6.10 to 12.20 in^3) of oil to break the oil film.

CAUTION

- Even if the outflow of the oil is not smooth, do not blow compressed air into the lubrication hose or the oil drain hose. Failure to observe this precaution may result in oscillator damage due to the possible flow of the turbo blower oil into the vacuum system of the oscillator.

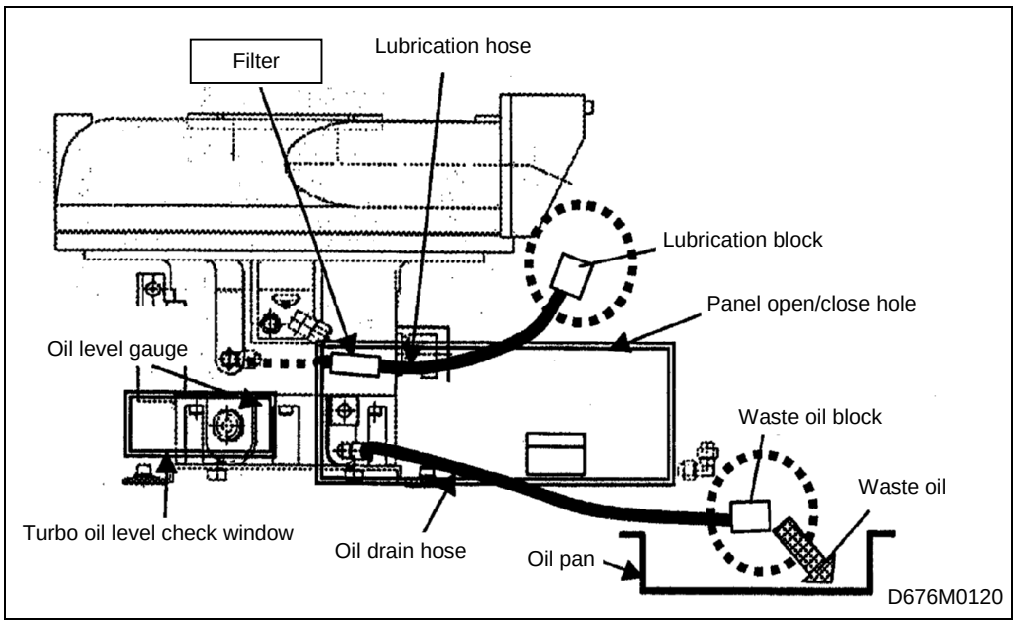


Fig. 7-35

(10) After the oil has been drained, mount the lid on the waste oil block (do not forget mounting the lid stopper).

CAUTION

- The oscillator, if operated with the lubrication block and the waste oil block unlidded, may be damaged by the possible flow of the turbo blower oil into the vacuum system of the oscillator. Therefore, be sure to mount the lid.
- Before mounting the lid on the lubrication block and the waste oil block, remove dirt from the side of the lid (especially, the O-rings) and the inside of the block. Dirt between the lid and the block may allow the vacuum pressure to leak from that section and oscillator damage could result.

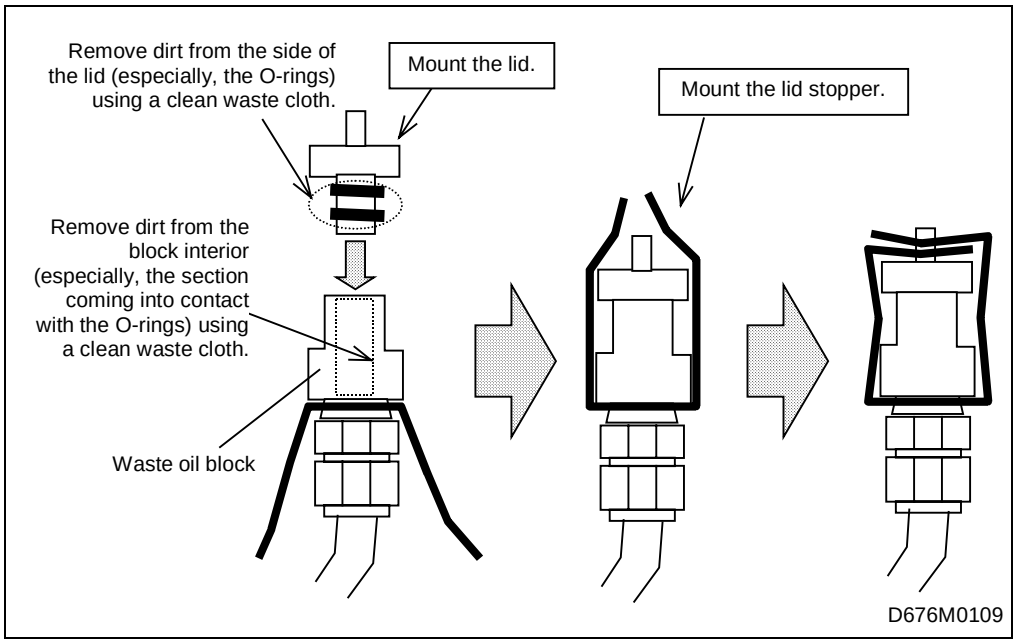

Remove dirt from the side of the lid (especially, the O-rings) using a clean waste cloth.
Mount the lid.
Mount the lid stopper.
Remove dirt from the block interior (especially, the section coming into contact with the O-rings) using a clean waste cloth.
Waste oil block
D676M0109

Fig. 7-36

(11) Insert the bottom end of the funnel into the lubrication block.

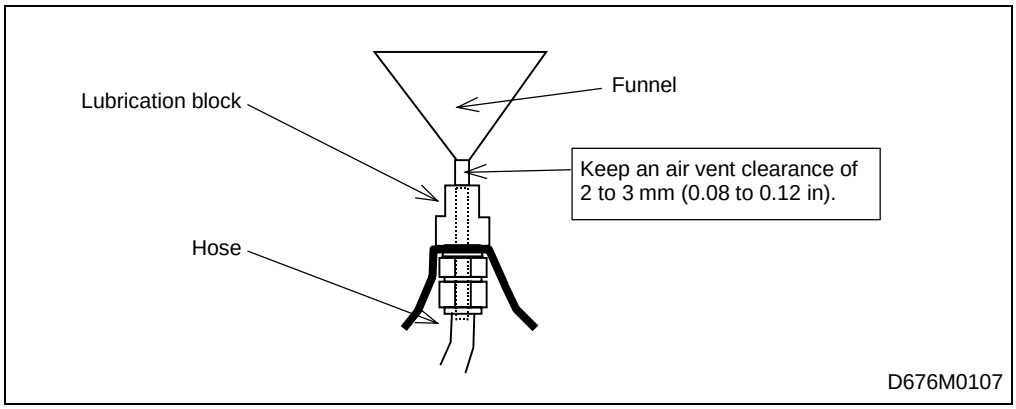


Fig. 7-37

(12) Observing the oil level gauge, replenish oil for a level between the upper and lower limits.

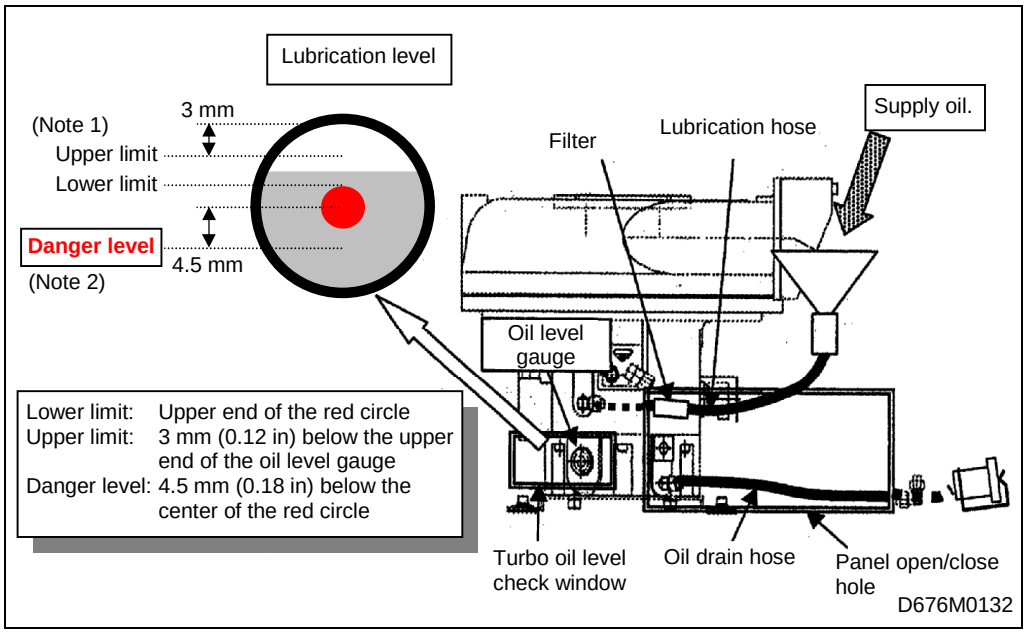


Fig. 7-38

Note 1: Be sure to replenish oil for a level between the upper and lower limits. Excessive replenishment may result in trouble with the turbo blower.

Note 2: If the oil level is below the danger level, immediately replenish oil to avoid the occurrence of trouble with the turbo blower.

(13) Mount the lid on the lubrication block in the same manner as described in step (10) above. Then replace the lubrication hose and the oil drain hose (12 mm or 0.47 in in diameter and 9 m or 30 ft long) in the fixing bracket.

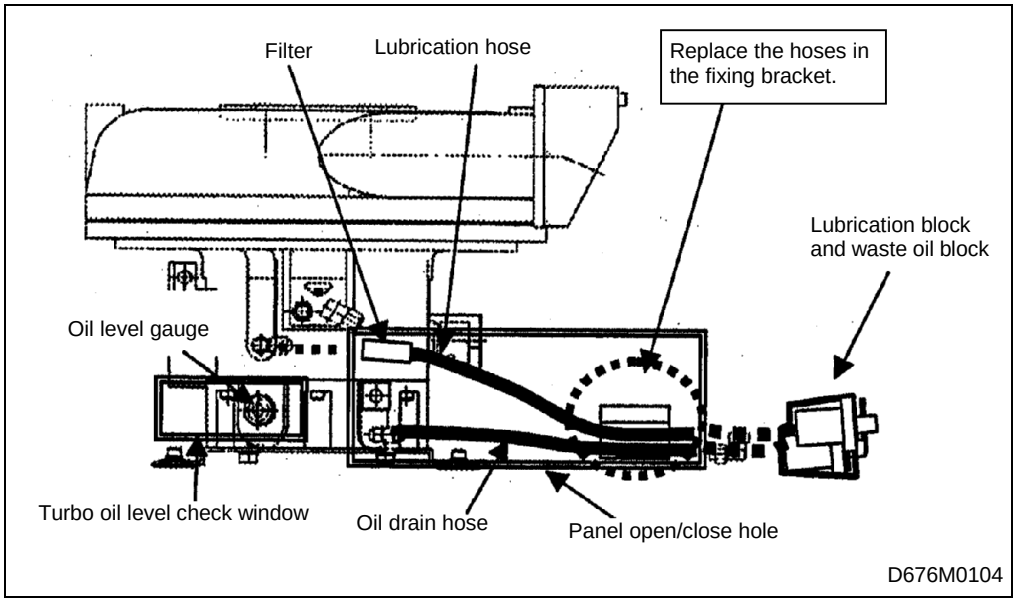


Fig. 7-39

(14) Remount the vacuum release plug. At this time, after cutting at least 20 mm (0.79 in) of the hose leading end, connect a new sleeve to the hose and then reconnect the sleeve-fitted hose itself using a reverse procedure to that of disconnection.

Note: Do not reuse the fastened old hose section and sleeve once they have been removed. The reuse of these sections causes the vacuum pressure to leak.

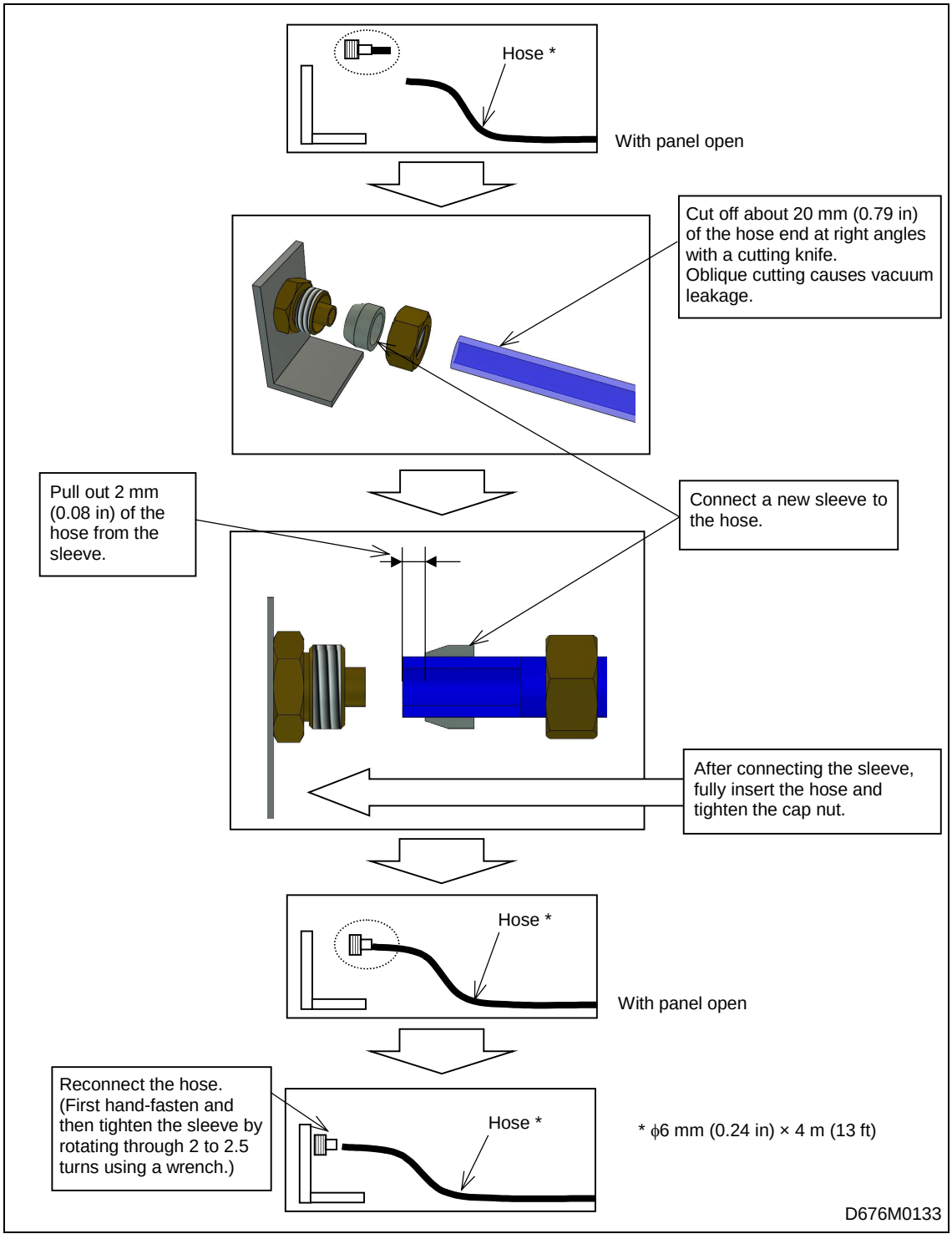

Hose *
With panel open
Cut off about 20 mm (0.79 in) of the hose end at right angles with a cutting knife.
Oblique cutting causes vacuum leakage.
Pull out 2 mm (0.08 in) of the hose from the sleeve.
Connect a new sleeve to the hose.
After connecting the sleeve, fully insert the hose and tighten the cap nut.
Hose *
With panel open
Reconnect the hose. (First hand-fasten and then tighten the sleeve by rotating through 2 to 2.5 turns using a wrench.)
Hose *
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0133

Fig. 7-40

(15) Mount the removed panel.

7-2-5 Procedure for changing the mechanical booster oil (1.8 kW)

1. Gear oil changing procedure

The oscillator is provided with a maintenance cover (panel K4), as shown in Fig. 7-41 below. Removing this cover allows you to perform lubrication of the oscillator.

WARNING

- Do not remove the maintenance cover for any purposes other than maintenance.
- Before removing the maintenance cover, always set the main power breaker to OFF and lock it.
- Never turn on the main power before attaching the maintenance covers. Failure to observe this could cause you to have a serious accident.

A. Requirements

- Hexagon key for 5 mm across flats
- Oil funnel (Accessory)
- Sleeve 6 mm in diameter (1 piece, accessory)
- Oil:
  2.0 L, or 0.071 ft^3, of ULVAC R-4
- Oil pan, with a capacity of 3 L or 0.106 ft^3
- Wrench for 12 mm across flats
- Waste cloth
- Cutting knife

B. Oil changing procedure

(1) Switch off the laser operation.

(2) Set the main power breaker to OFF.

(3) Allow a cooling time of at least 30 minutes before proceeding with oil change.

(4) Open the K4 panel.

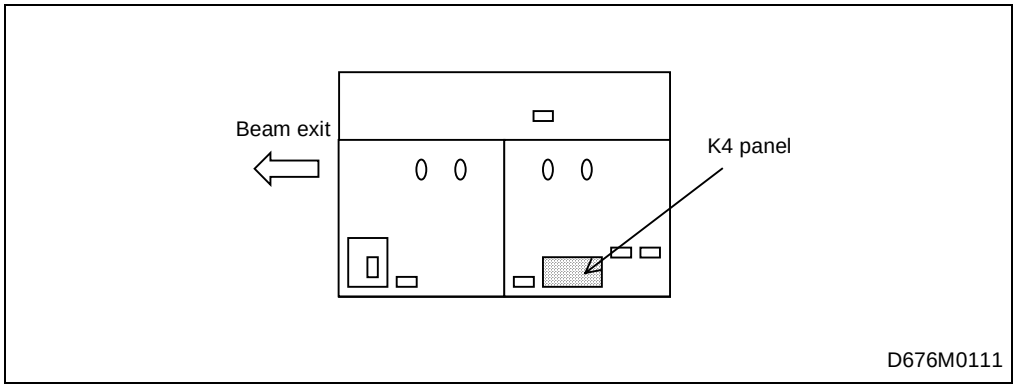


Fig. 7-41

(5) Release the vacuum pressure through the open/close hole of the K4 panel.

CAUTION

- Releasing the vacuum pressure refers to returning the internal vacuum system of the oscillator from its normal vacuum status to an atmospheric pressure. Oscillator damage may result if this operation is not performed as directed below. Proceed in strict accordance with the directions.

First, loosen the nut on the vacuum release plug (having a connected hose 6 mm or 0.24 in in diameter and 4 m or 13 ft long) using a wrench and remove the nut. Next after removing the plug, leave the vacuum system intact for at least about 15 minutes.

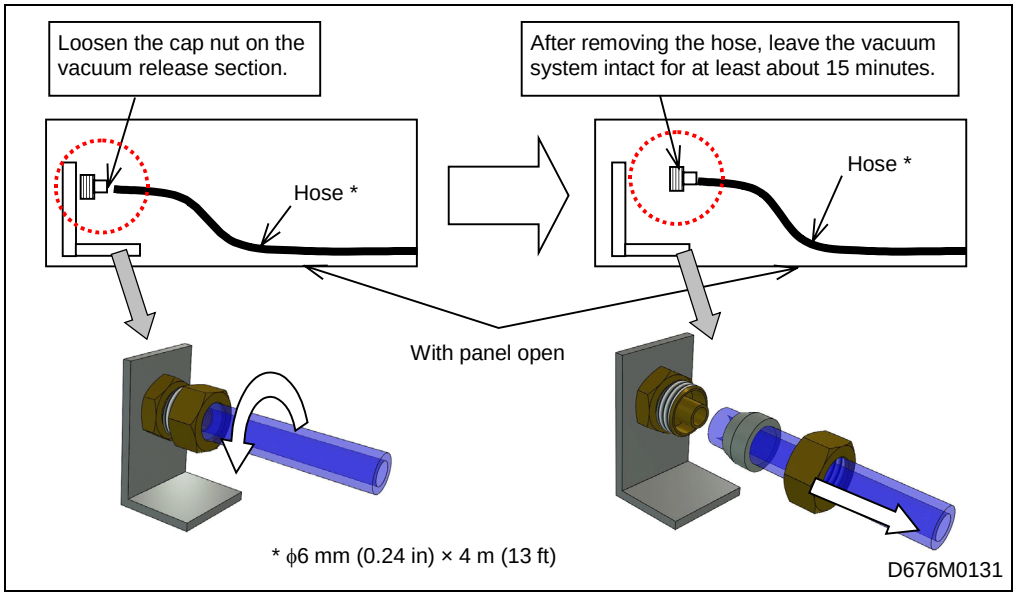

Loosen the cap nut on the vacuum release section.
After removing the hose, leave the vacuum system intact for at least about 15 minutes.
Hose *
Hose *
With panel open
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0131

Fig. 7-42

Note: When disconnecting the hose, be careful not to allow dust to enter the hose.

(6) Remove the lubrication block - hose assembly and the waste oil block - hose assembly from the fixing bracket.

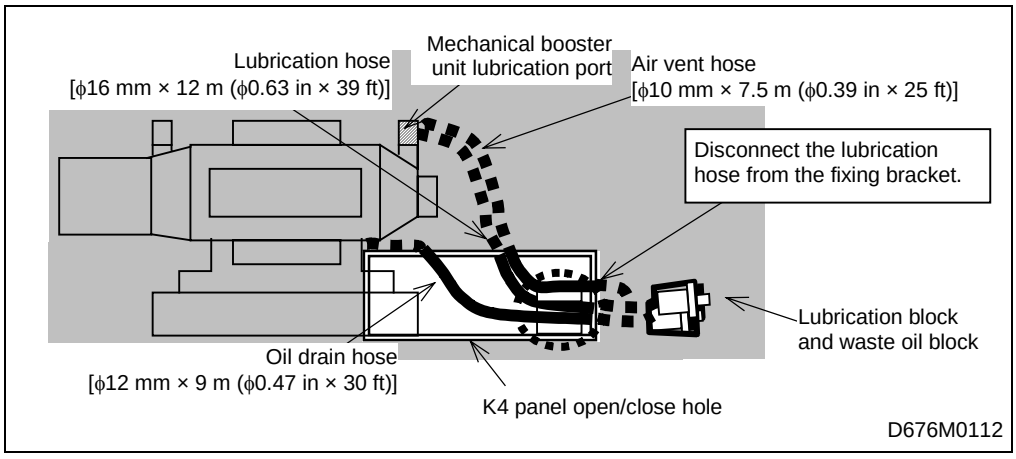

Lubrication hose
[ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Mechanical booster unit lubrication port
Air vent hose
[ϕ10 mm × 7.5 m (ϕ0.39 in × 25 ft)]
Disconnect the lubrication hose from the fixing bracket.
Lubrication block and waste oil block
Oil drain hose
[ϕ12 mm × 9 m (ϕ0.47 in × 30 ft)]
K4 panel open/close hole
D676M0112

Fig. 7-43

(7) Pull the lubrication block and the waste oil block out to the front from the open/close hole of the K4 panel.

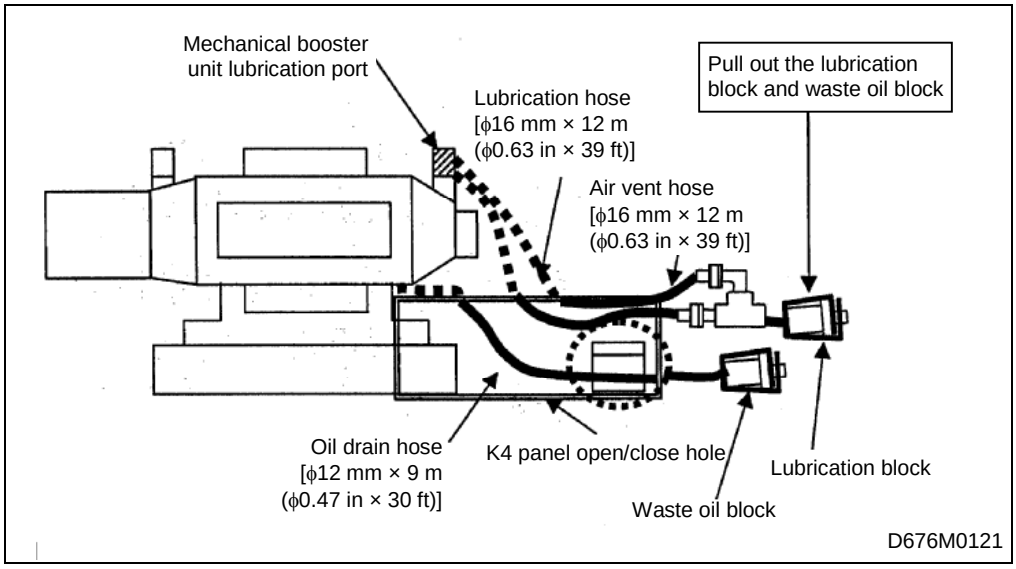

Mechanical booster unit lubrication port
Lubrication hose [ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Pull out the lubrication block and waste oil block
Air vent hose [ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Oil drain hose [ϕ12 mm × 9 m (ϕ0.47 in × 30 ft)]
K4 panel open/close hole
Lubrication block
Waste oil block
D676M0121

Fig. 7-44

(8) Insert the both front ends of the lubrication block and the waste oil block into an oil pan with a capacity of 2 to 3 L (0.071 to 0.106 ft^3).

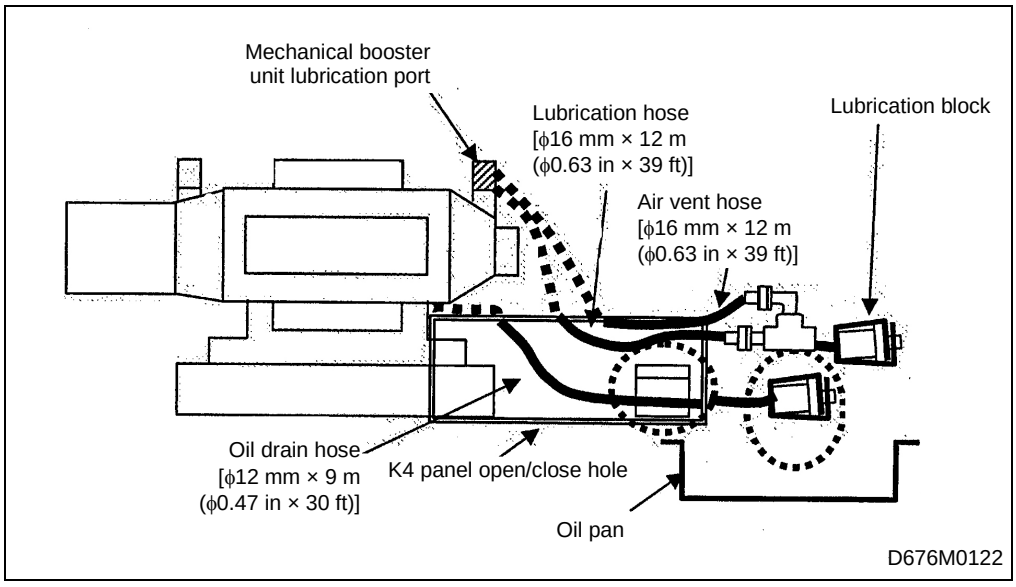

Mechanical booster unit lubrication port
Lubrication hose [ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Lubrication block
Air vent hose [ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Oil drain hose [ϕ12 mm × 9 m (ϕ0.47 in × 30 ft)]
K4 panel open/close hole
Oil pan
D676M0122

Fig. 7-45

(9) Remove the lids from both the waste oil block and the lubrication block.

CAUTION

- Before unlidding the lubrication block, make sure that a time of at least about 15 minutes has passed since the vacuum pressure was released. If the lubrication block is unlidded before the vacuum release is completed, the oscillator may be damaged by the possible flow of the mechanical booster oil into the vacuum system of the oscillator. Be sure to perform the above confirmation.

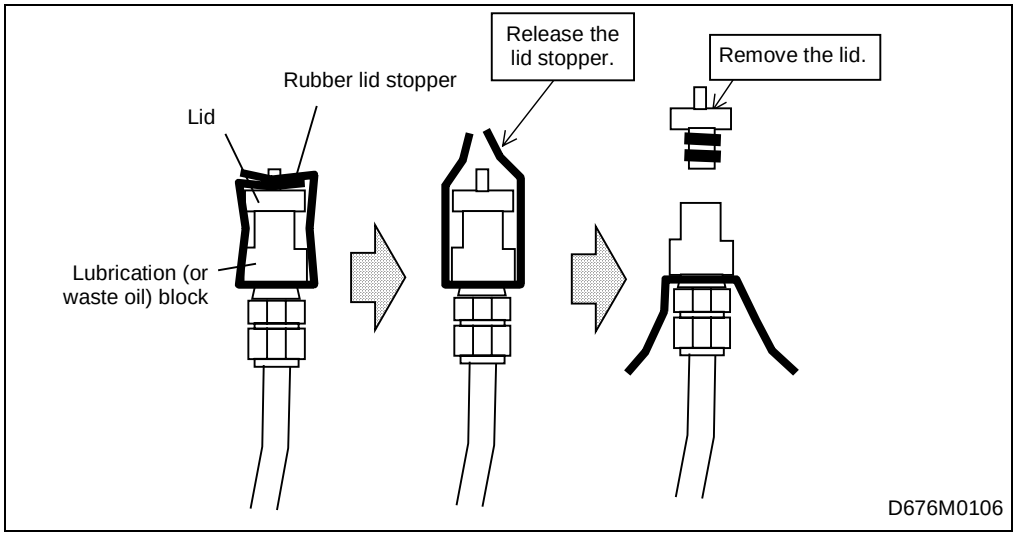


Fig. 7-46

Note: At this step, see to it that no dust sticks to the lid of the oiling port or to the O-ring or enters the oiling hose; otherwise vacuum leakage will result.

Unlidding the block allows the oil to flow out. Receive it using an oil pan. Drain the oil from the air vent hose (10 mm or 0.39 in in diameter and 7.5 m or 25 ft long) through the waste oil block. If oil is left inside the air vent hose, the air inside cannot be completely discharged and the lubrication normally completed within 5 - 10 minutes may require 60 minutes or more.

CAUTION

- Even if the outflow of the oil is not smooth, do not blow compressed air into the lubrication hose or the oil drain hose. Failure to observe this precaution may result in oscillator damage due to the possible flow of the mechanical booster oil into the vacuum system of the oscillator.

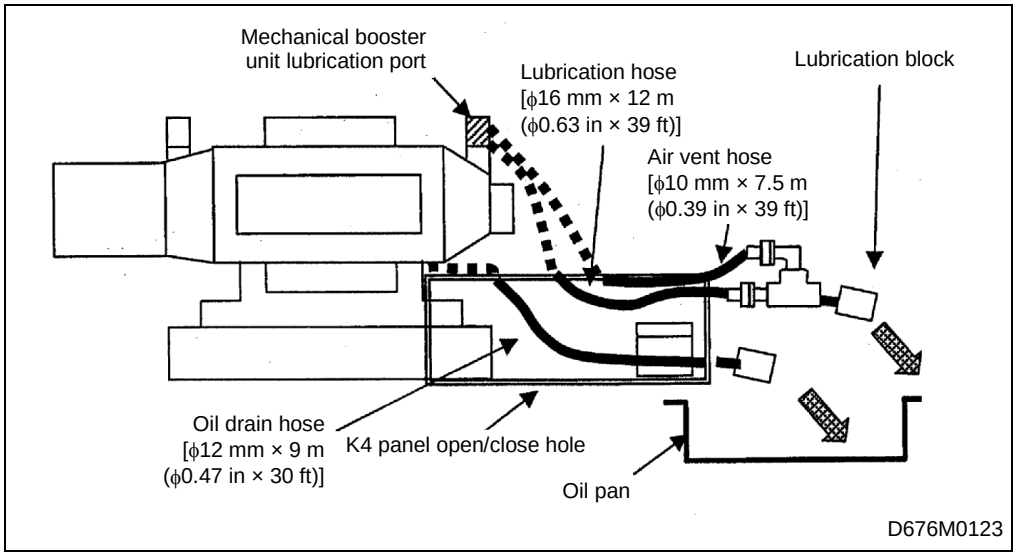

Mechanical booster unit lubrication port
Lubrication hose [ϕ16 mm × 12 m (ϕ0.63 in × 39 ft)]
Lubrication block
Air vent hose [ϕ10 mm × 7.5 m (ϕ0.39 in × 39 ft)]
Oil drain hose [ϕ12 mm × 9 m (ϕ0.47 in × 30 ft)]
K4 panel open/close hole
Oil pan
D676M0123

Fig. 7-47

(10) After the oil has been drained, mount the lid on the waste oil block (do not forget mounting the lid stopper).

CAUTION

- The oscillator, if operated with the lubrication block and the waste oil block unlidded, may be damaged by the possible flow of the mechanical booster oil into the vacuum system of the oscillator. Therefore, be sure to mount the lid.
- Before mounting the lid on the lubrication block and the waste oil block, remove dirt from the side of the lid (especially, the O-rings) and the inside of the block. Dirt between the lid and the block may allow the vacuum pressure to leak from that section and oscillator damage could result.

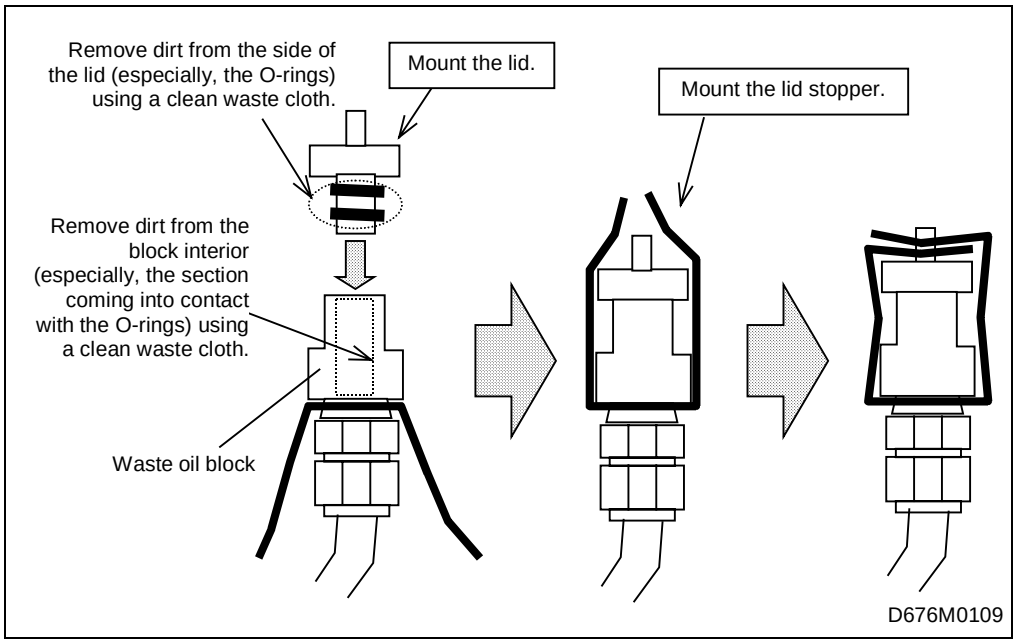

Remove dirt from the side of the lid (especially, the O-rings) using a clean waste cloth.
Mount the lid.
Mount the lid stopper.
Remove dirt from the block interior (especially, the section coming into contact with the O-rings) using a clean waste cloth.
Waste oil block
D676M0109

Fig. 7-48

(11) Insert the bottom end of the funnel into the lubrication block.

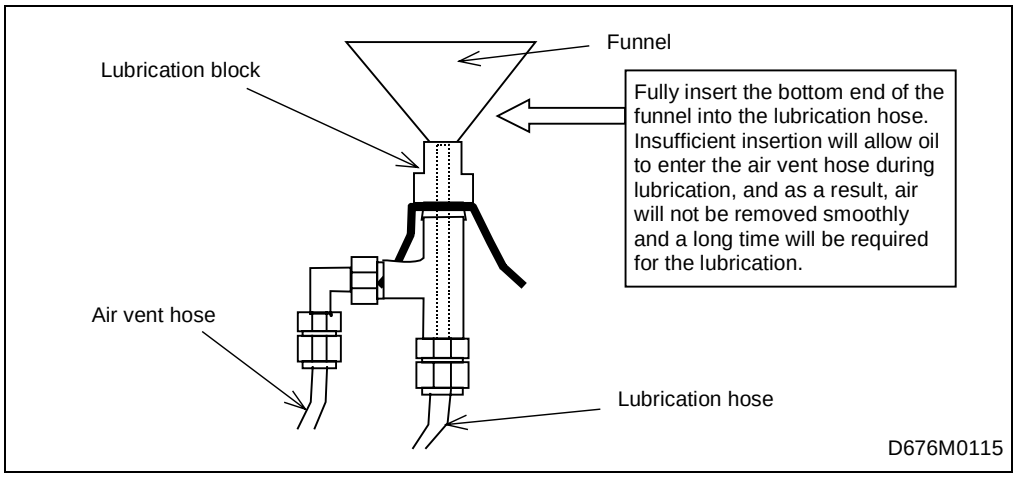

Funnel
Lubrication block
Fully insert the bottom end of the funnel into the lubrication hose. Insufficient insertion will allow oil to enter the air vent hose during lubrication, and as a result, air will not be removed smoothly and a long time will be required for the lubrication.
Air vent hose
Lubrication hose
D676M0115

Fig. 7-49

(12) Supply oil from the funnel until the oil level gauge of the mechanical booster has indicated a level between the maximum and minimum allowable level marks.

Note: It takes about one minute for the supplied oil to pervade the entire interior of the mechanical booster. After the oil has been supplied up to the appropriate level, since the oil level may decrease, check it about one minute after the lubrication. Add oil if the oil level has decreased.

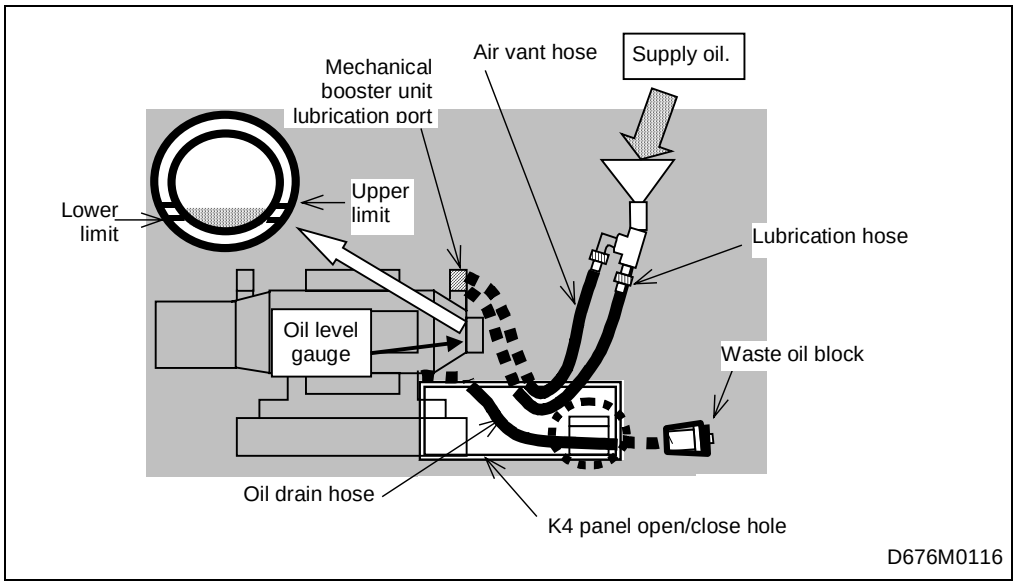


Fig. 7-50

(13) Mount the lid on the lubrication block in the same manner as described in step (10) above. Then replace the lubrication block [lubrication hose (16 mm or 0.63 in in diameter and 12 m or 40 ft long) and the air vent hose (10 mm or 0.39 in in diameter and 7.5 m or 25 ft long)] and the waste oil block [oil drain hose (12 mm or 0.47 in in diameter and 9 m or 30 ft long)] in the fixing bracket.

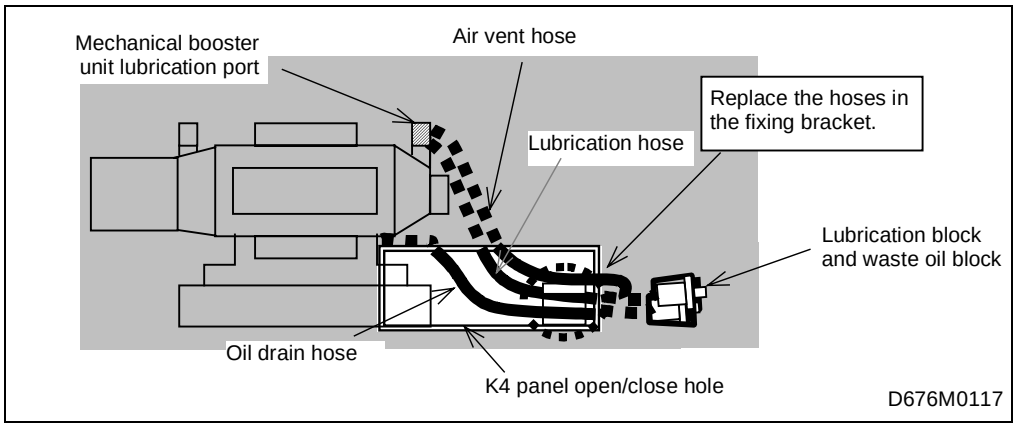


Fig. 7-51

(14) Remount the vacuum release plug. At this time, after cutting at least 20 mm (0.79 in) of the hose leading end, connect a new sleeve to the hose and then reconnect the sleeve-fitted hose itself using a reverse procedure to that of disconnection.

Note: Do not reuse the fastened old hose section and sleeve once they have been removed. The reuse of these sections causes the vacuum pressure to leak.

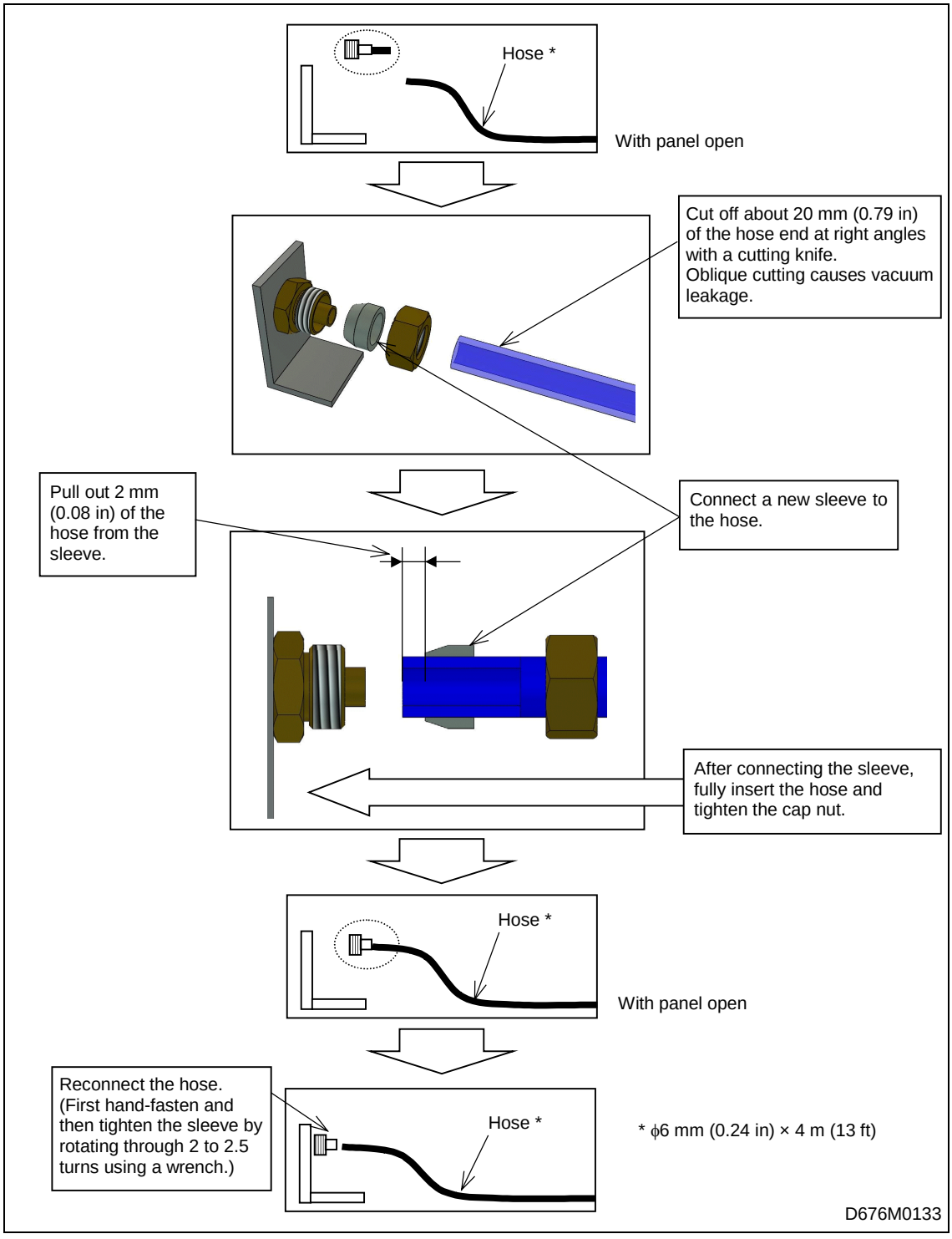

Hose *
With panel open
Cut off about 20 mm (0.79 in) of the hose end at right angles with a cutting knife.
Oblique cutting causes vacuum leakage.
Pull out 2 mm (0.08 in) of the hose from the sleeve.
Connect a new sleeve to the hose.
After connecting the sleeve, fully insert the hose and tighten the cap nut.
Hose *
With panel open
Reconnect the hose. (First hand-fasten and then tighten the sleeve by rotating through 2 to 2.5 turns using a wrench.)
Hose *
* ϕ6 mm (0.24 in) × 4 m (13 ft)
D676M0133

Fig. 7-52

(15) Mount the removed panel.

7-3 Oscillator Maintenance

7-3-1 Cleaning the strainer contained at the inlet of the oscillator cooling water

A mesh-structured strainer 1 mm (0.039 in) in aperture size is contained at the inlet of the cooling water to the oscillator to prevent dirt from entering it. Continued use of this strainer for an extended period permits dirt to stick to the filter, reducing the flow rate of the oscillator cooling water. The resulting activation of an alarm lamp of the laser oscillator which indicates decreases in the flow rate of the cooling water may prevent the oscillator from operating properly. For this reason, the strainer needs to be periodically checked and its filter requires removal of dirt. When checking the water pressure gauge of the chiller unit, if the indication on the gauge is in excess of the value listed in “Daily inspection items” table, also be sure to check the strainer and remove dirt. (Refer to Table 4-1 and Note 2 in “4-1 Maintenance and Inspection”.)

1. Procedure for cleaning the built-in strainer

(1) Turn off the oscillator and the chiller.

(2) Close the water supply valve and draining valve of the chiller.

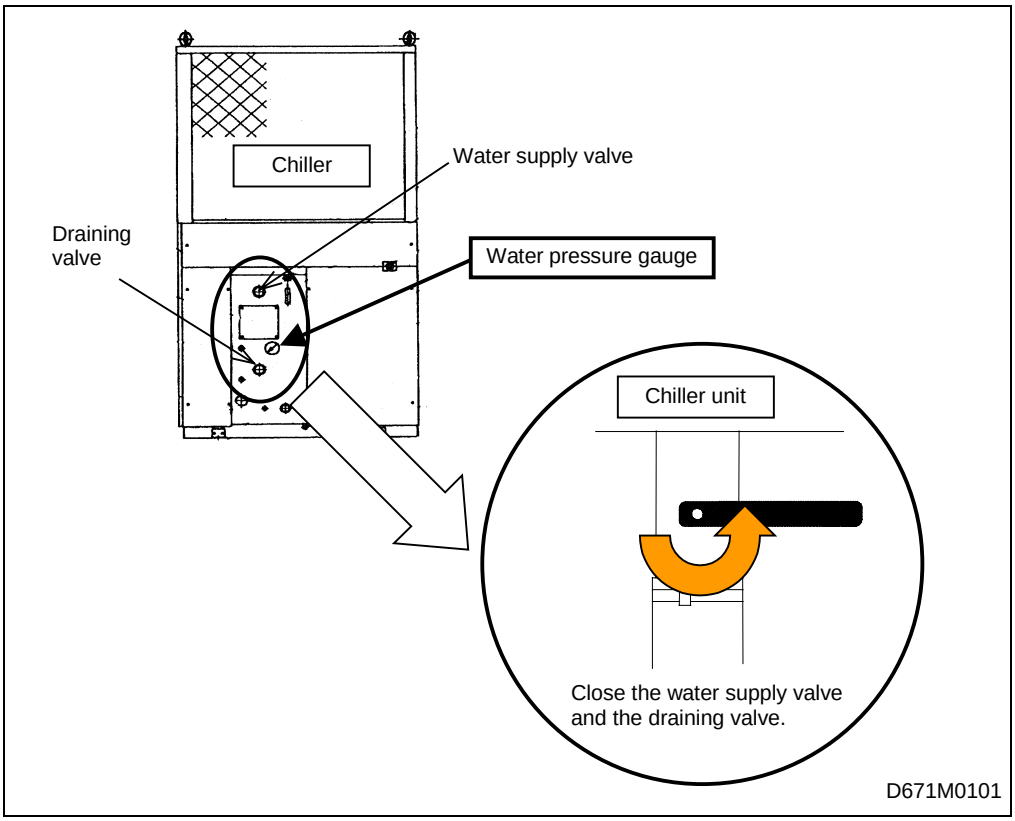


Fig. 7-53 Locations of the chiller unit water supply and draining valves

(3) Place a water receiving pan (about 20 L (0.71 ft^3) in capacity) under the water inlet of the oscillator, and remove the mounting screws from the built-in strainer. (Be careful since about 10 to 15 L (0.35 to 0.53 ft^3) of water will flow out. The quantity of water flowing out depends on the chiller piping length and other factors.)

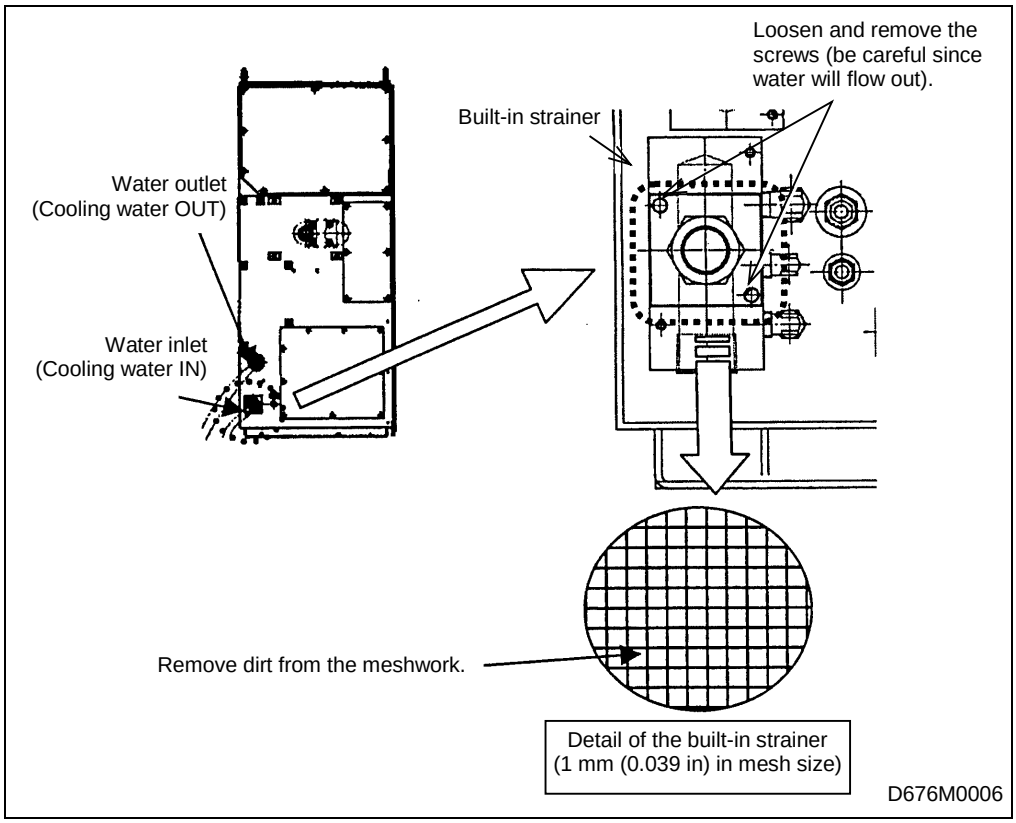

Loosen and remove the screws (be careful since water will flow out).
Built-in strainer
Water outlet (Cooling water OUT)
Water inlet (Cooling water IN)
Remove dirt from the meshwork.
Detail of the built-in strainer (1 mm (0.039 in) in mesh size)
D676M0006

Fig. 7-54 Location of the built-in strainer

(4) Wash dirt away from the meshwork of the built-in strainer, and remount the strainer in the reverse order to that of removal.

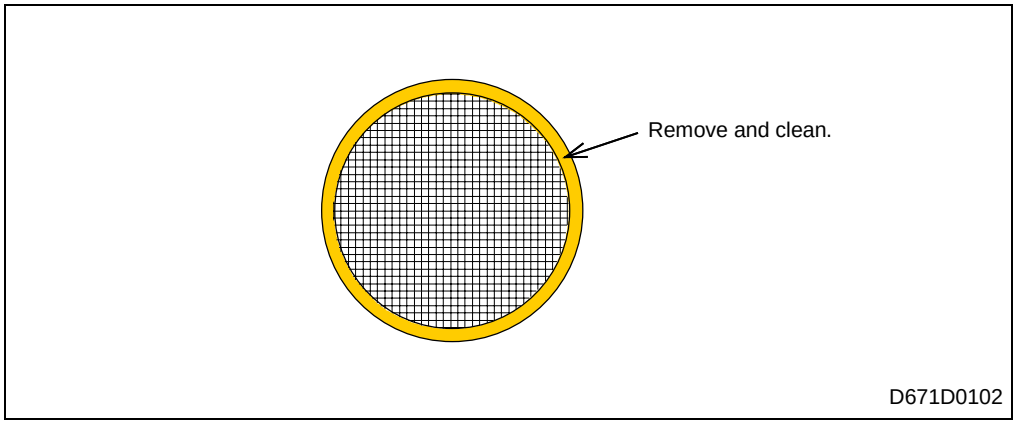


Fig. 7-55 Meshwork of the built-in strainer

CAUTION

- If the strainer remains removed, the oscillator will have its water circuit clogged and result in trouble. If the mounting screws of the strainer remains removed or loose, water leakage will result. Be sure to tighten up the screws

7-3-2 Cleaning the water circuit

CAUTION

- Described below is the water circuit cleaning procedure that applies to chiller units manufactured by ORION Machinery. If a chiller unit other than those manufactured by ORION Machinery is used, follow its maintenance manual when cleaning it.

If the original water pressure is not recovered after cleaning the filter, the water circuit in the oscillator is likely to be clogged with dirt such as water deposits. In such a case, therefore, it is necessary to add a washing agent to the cooling water and wash the dirt away from the water circuit of the oscillator.

1. Recommended washing agent

DESLIME (manufactured by DIA AQUA SOLUTIONS CO., INC.)

2. Directions for washing

(1) Open the drain cock of the chiller and drain out all water from the tank. After this, refill the tank up to the required water level.

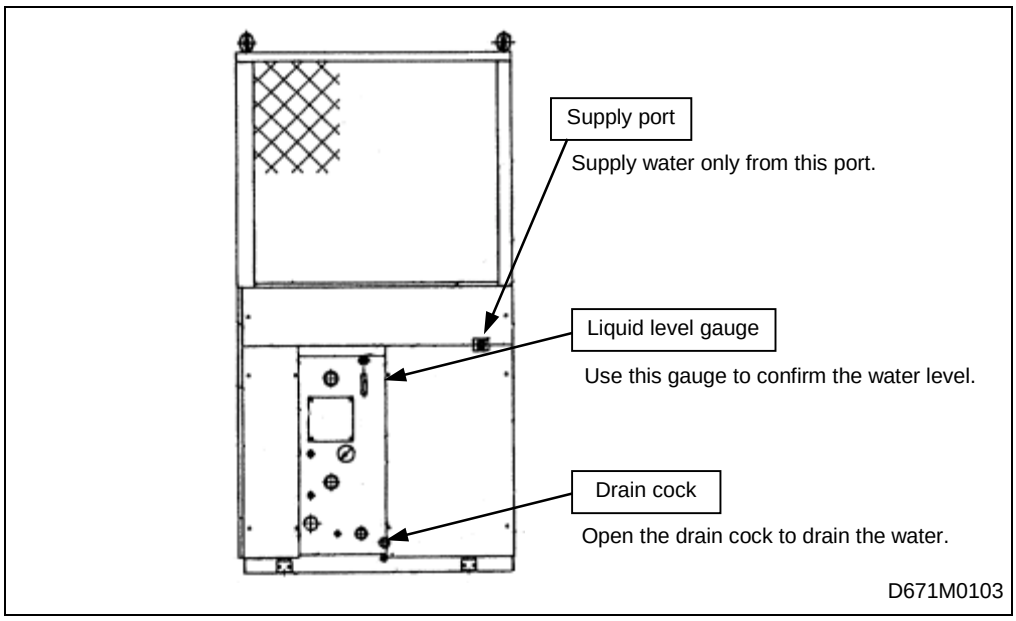

Supply port
Supply water only from this port.
Liquid level gauge
Use this gauge to confirm the water level.
Drain cock
Open the drain cock to drain the water.
D671M0103

Fig. 7-56 Locations of the chiller unit water supply and draining ports

(2) Add DESLIME by 5 - 10% of the water in the water tank and then operate the oscillator for two hours in succession under a pre-discharge status (high pressure ON).

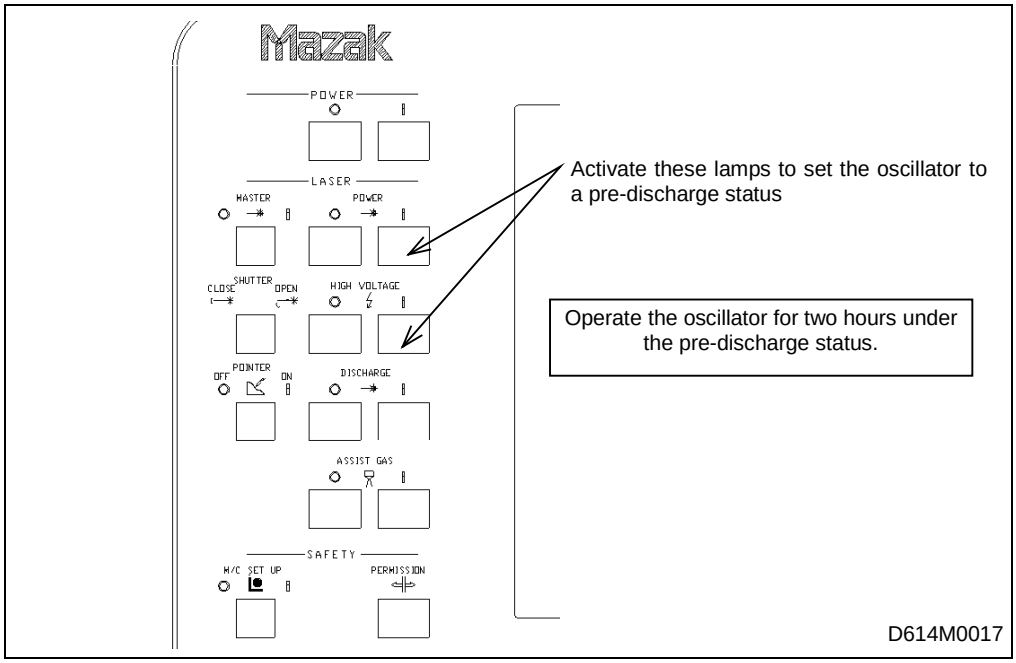


Fig. 7-57 Pre-discharge status

(3) After turning off the chiller and the oscillator, drain the water by opening the drain cock of the chiller.

Note: After turning off the chiller and the oscillator, check the built-in strainer of the oscillator for clogging and clean the strainer. See Subsection 7-3-1, Cleaning the strainer contained at the inlet of the oscillator cooling water, for further details.

(4) After the water has been drained, refill the tank up to the required water level and then operate the oscillator for five minutes under the status mentioned in step (2) above.

Note: After turning off the chiller and the oscillator, check the built-in strainer of the oscillator for clogging and clean the strainer. See Subsection 7-3-1, Cleaning the strainer contained at the inlet of the oscillator cooling water, for further details.

(5) Repeat step (4) above until any dirt in the water has been completely removed. Clear water can usually be obtained by repeating step (4) two to three times.

(6) Add a water treatment agent so as to avoid the corrosion of the cooling water system, the accumulation of scales, and the occurrence of slime. The recommended water treatment agents are listed below. When using these additives, please contact the manufacturer of the chiller. Also, refer to the instruction manuals of these additives for a description of their usage directions.

- Rust preventive:
  CONTLIME K-6000, DIA AQUA SOLUTIONS CO., INC.
- Prevention from scales and slimes:
  CONTLIME #30, DIA AQUA SOLUTIONS CO., INC.

7-4 Changing the Air Filter for Shutter-Connecting Hose

1. Changing procedure

Note: Clean the periphery of the filter and the connected hose beforehand completely with a waste cloth.

(1) Stop the laser oscillator.

(2) Set the main power breaker to OFF and let the machine cool down for at least 10 minutes.

(3) Remove the panel shown in Fig. 7-58, and replace both the oil mist filter (AMD150) and the semiconductor manufacture-use filter.

A. Changing the oil mist filter (AMD150)

(1) Remove the four M5 screws holding the filter housing and filter cover.

(2) Remove the filter housing by pulling it downward.

(3) Remove the filter element from the filter housing, and insert a new filter element.

(4) Mount the filter housing on the filter cover, and fix them anew using the screws.

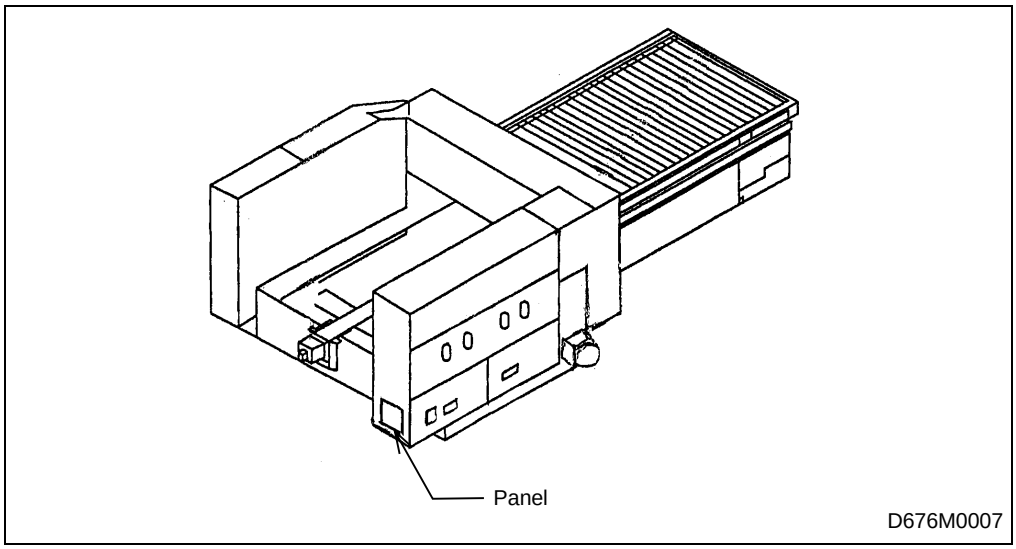


Fig. 7-58 Changing the oil mist filter (AMD150)

B. Changing the semiconductor manufacture-use filter

(1) Remove the filter fixing screws, and disconnect the hoses from both ends of the filter (first, remove the orange cap using needle nose pliers, and then disconnect the hose).

(2) Fix one end of the filter body securely with a vice, and rotate the other end counterclockwise using a wrench.
The filter body will split in half in the middle so that the filter element can be removed.

(3) Replace the filter element with a new one, and remount the filter by reversing the above procedure.

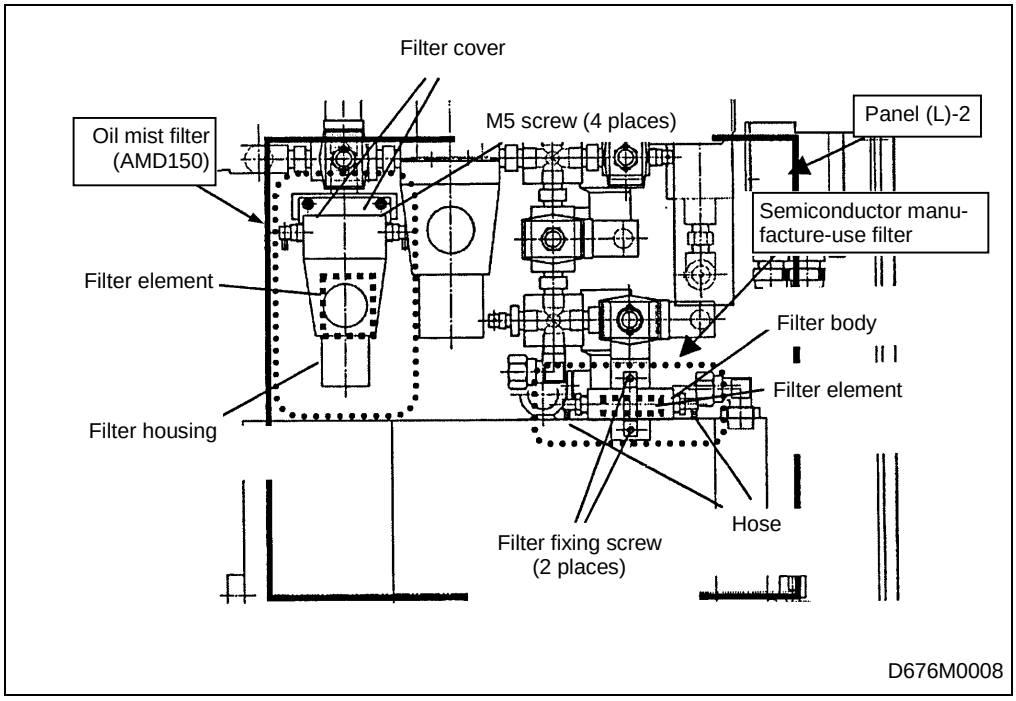


Fig. 7-59 Changing the semiconductor manufacture-use filter

7-5 Maintenance of the Gear Box

7-5-1 X-axis gear box

1. Checking the quality and quantity of oil (every month)

- Check the oil quantity and replenish oil as required.
- Check the oil quality visually through the oil-level glass.
- Replacement interval: Every 2000 operation hours.

2. Oil change

- Requirements

  Wrench
  Adjustable wrench
  Oil jug
  Oil brand: VACTRA No. 2 (MOBIL)
  Oil amount: 0.7 L or 0.025 ft^3 for ST-X48 MkIII; 3.5 L or 0.124 ft^3 for ST-X510/612 MkIII
  Oil pan, with a capacity of 4 L or 0.141 ft^3
  Waste cloth

- Changing procedure

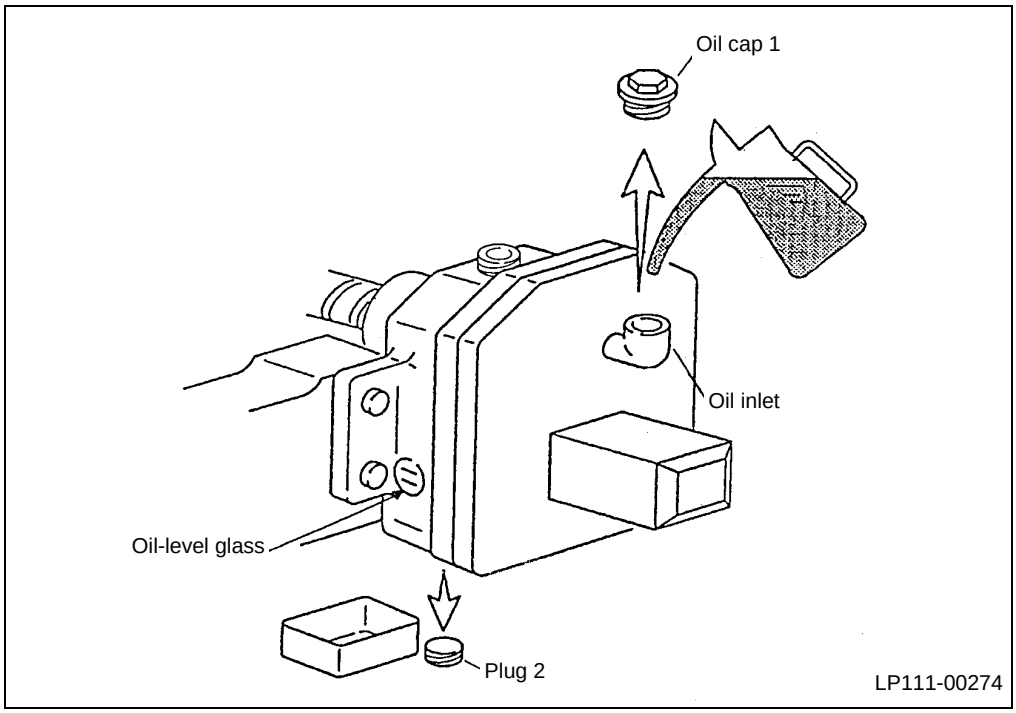


Fig. 7-60 Oil change for the X-axis gear box

(1) Switch off the laser operation.

(2) Turn off the main power.

(3) Let the machine cool down for about 10 minutes.

CAUTION

- Keep in mind that the oil is very hot just after the stop of the machine and, accordingly, take care not to get burned.

(4) Remove oil cap 1.

(5) Place a container under the gear box.

(6) Remove plug 2.

(7) Drain the gear box completely of oil. (It takes about 5 minutes.)

(8) Fit plug 2 after wrapping it in sealing tape to prevent oil leakage.
Wipe the oil off the bottom of the gear box with waste cloth.

(9) Pour new oil through the oil inlet with an oil jug.
Check the amount at the oil-level glass.

(10) Attach oil cap 1.

(11) Check the gear box for oil leakage.
If there is any leakage, repeat steps (5) to (10).

(12) Turn on the main power and move the table to-and-fro on the X-axis several times.

(13) Stop the machine operation, and turn off the main power.

(14) Check the oil amount at the oil-level glass and, if required, replenish and drain oil respectively in the same manner as indicated above under (5) to (10).

(15) If a considerable contamination of oil is observed, repeat the oil change procedure as required.

7-5-2 Y-axis gear box (only for 612)

1. Checking the quality and quantity of oil (every month)

- Check the oil quantity and replenish oil as required.
- Check the oil quality visually through the oil-level glass.
- Replacement interval: Every 2000 operation hours.

2. Oil change

- Requirements

Wrench
Adjustable wrench
Oil jug
Oil brand: VACTRA No. 2 (MOBIL)
Oil amount: 0.6 L or 0.021 ft^3 for ST-X612 MkIII
Oil pan, with a capacity of 1 L or 0.035 ft^3
Waste cloth

- Changing procedure

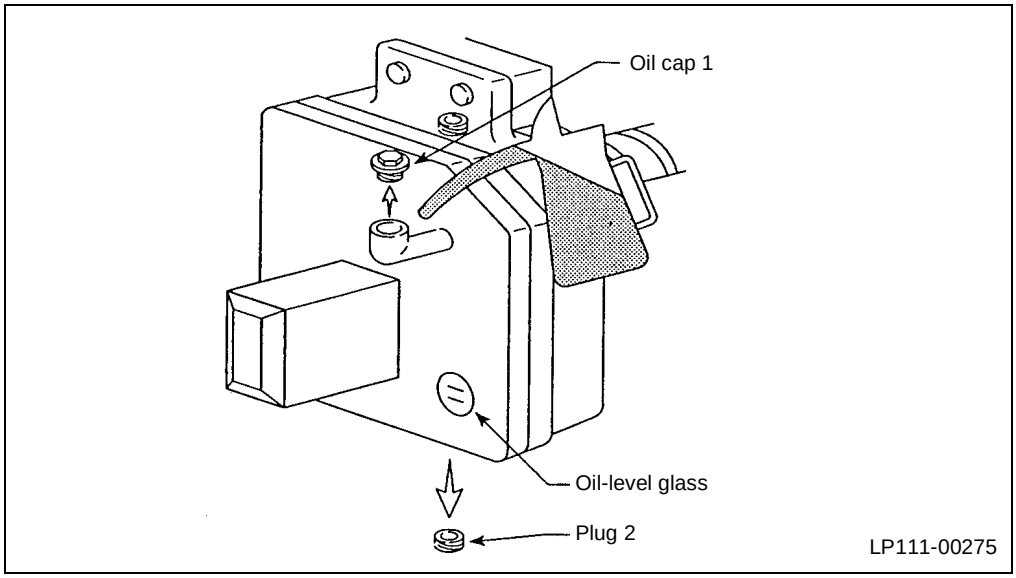


Fig. 7-61 Oil change for the Y-axis gear box

(1) Switch off the laser operation.

(2) Turn off the main power.

(3) Let the machine cool down for about 10 minutes.

CAUTION

- Keep in mind that the oil is very hot just after the stop of the machine and, accordingly, take care not to get burned.

(4) Remove oil cap 1.

(5) Place a container under the gear box.

(6) Remove plug 2.

(7) Drain the gear box completely of oil. (It takes about 5 minutes.)

(8) Fit plug 2 after wrapping it in sealing tape to prevent oil leakage.
Wipe the oil off the bottom of the gear box with waste cloth.

(9) Pour new oil through the oil inlet with an oil jug.
Check the amount at the oil-level glass.

(10) Attach oil cap 1.

(11) Check the gear box for oil leakage.
If there is any leakage, repeat steps (5) to (10).

(12) Turn on the main power and move the saddle to-and-fro on the Y-axis several times.

(13) Stop the machine operation, and turn off the main power.

(14) Check the oil amount at the oil-level glass and, if required, replenish and drain oil respectively in the same manner as indicated above under (5) to (10).

(15) If a considerable contamination of oil is observed, repeat the oil change procedure as required.

7-6 Maintenance of the Dust Collector Duct

The dust collector for the ST-X MkIII is provided with two cleaning holes in the machine, and one cleaning hole in the rear safety fence. Check and clean the dust collector at least once a month.

After non-oxidation cutting (e.g., cutting of an aluminum plate using Nitrogen gas), clean the dust collector immediately. Otherwise, the dust produced during non-oxidation cutting may react chemically with the moisture in the air, producing heat and catching fire.
(Refer to Subsection 2-1-6.)

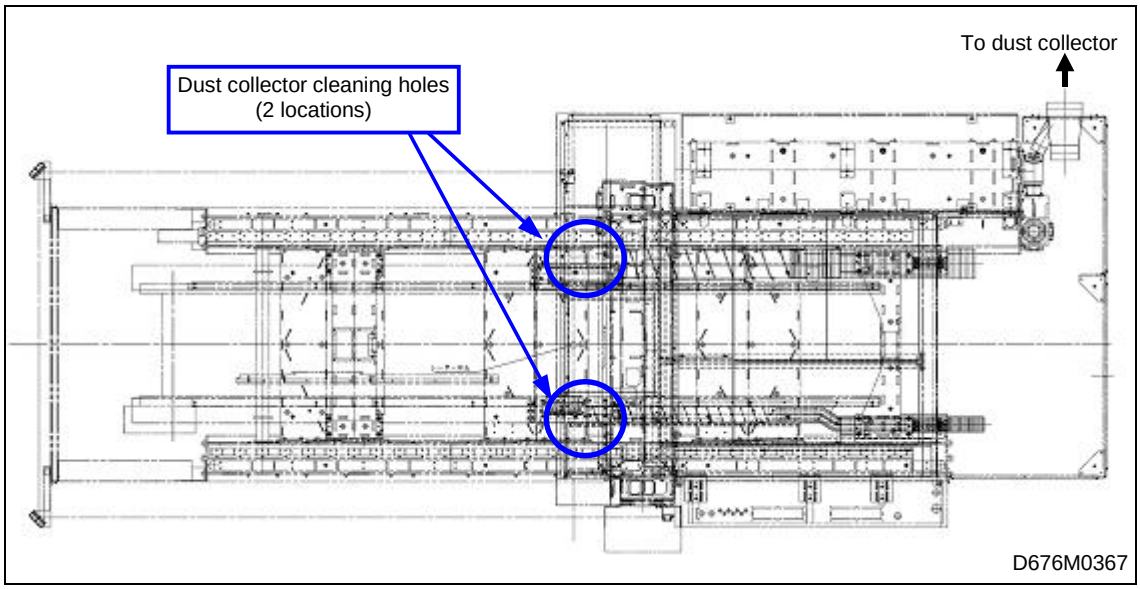


Fig. 7-62 Cleaning the dust collector duct (ST-X48/510 MkIII)

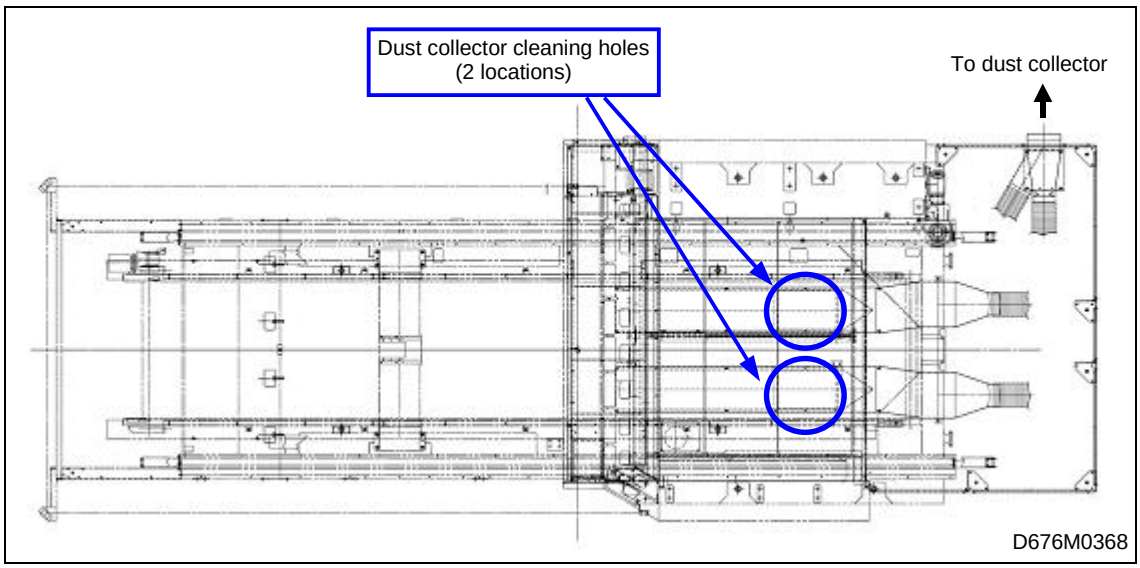


Fig. 7-63 Cleaning the dust collector duct (ST-X612 MkIII)

1. Cleaning the dust collector cleaning holes (ST-X48/510 MkIII)

- Cleaning procedure

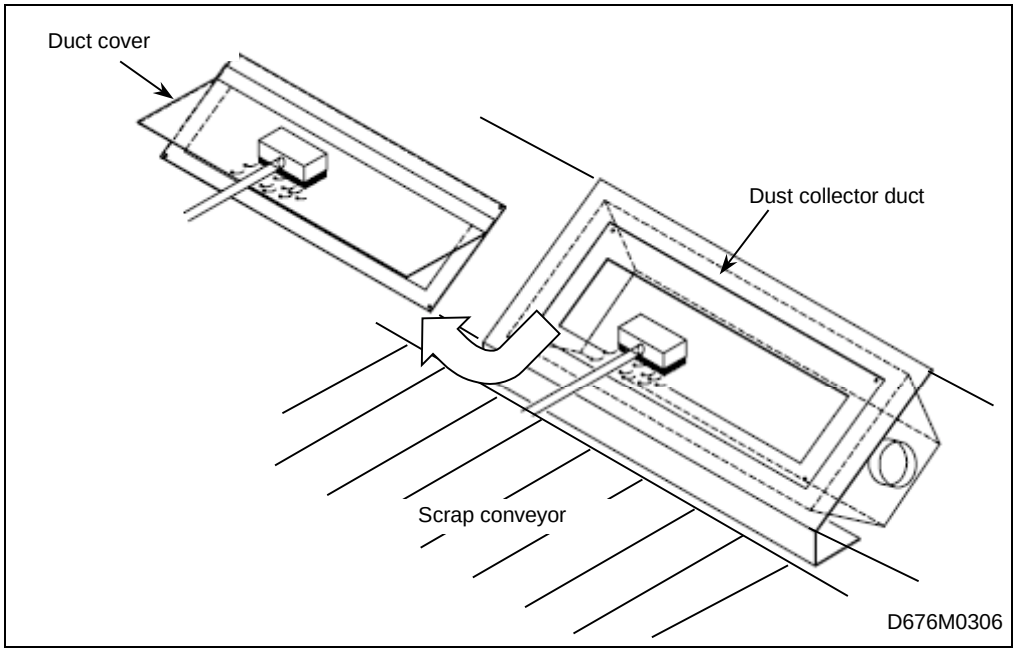


Fig. 7-64 Cleaning the dust collector cleaning holes (ST-X48/510 MkIII)

(1) Turn on the main power and then switch on the NC unit.
(2) Move the table to a position where the duct cover is exposed.
(3) Press the EMERGENCY STOP button to inhibit the motion of the table.
(4) Press the EXHAUST UNIT button on the operating panel to turn on the unit.
(5) Tip the duct to remove dust accumulated on the duct cover.
(6) Remove the screws fixing the duct cover to detach the cover.
(7) Rake off dust accumulated inside the duct of the dust collector.
(8) Remount the duct cover.
(9) Also, clean the duct on the opposite side using the same procedure as the above.

2. Cleaning the duct (ST-X612 MkIII)

- Cleaning procedure

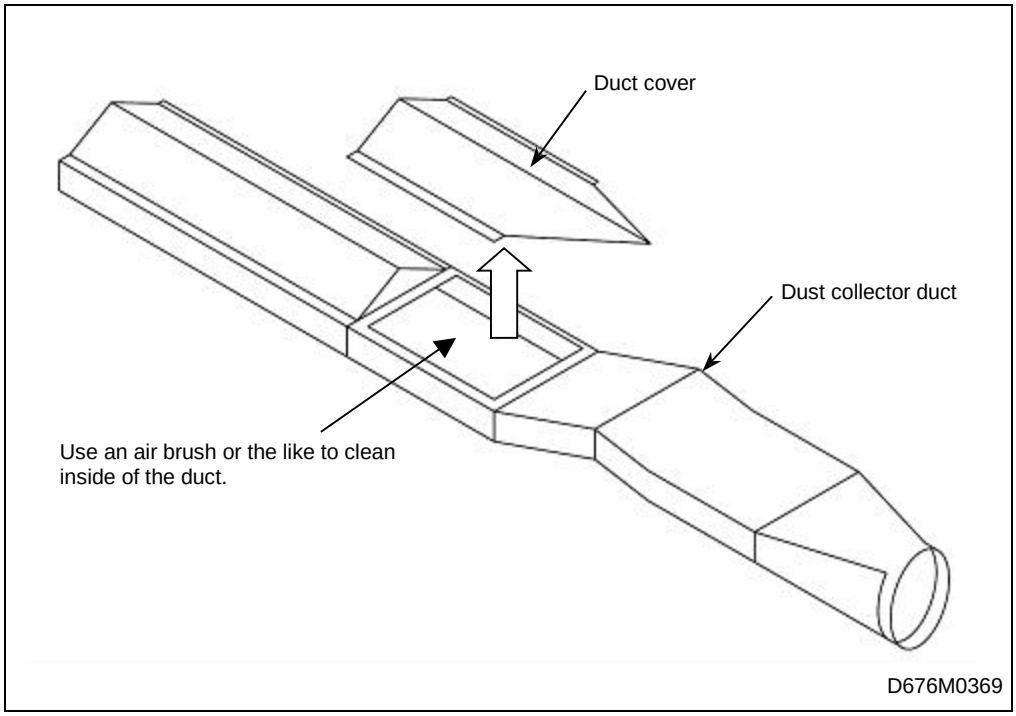


Fig. 7-65 Cleaning the duct (ST-X612 MkIII)

(1) Turn on the main power and then switch on the NC unit.

(2) Press the EXHAUST UNIT button on the operating panel to turn on the unit.

(3) Tip the duct to remove dust accumulated on the duct cover.

(4) Remove the screws fixing the duct cover to detach the cover.

(5) Clean the dust accumulated inside the duct of the dust collector using an air brush or the like.

(6) Remount the duct cover.

(7) Also, clean the duct on the opposite side using the same procedure as the above.

7-7 Maintenance of the Air Circuit Filter

7-7-1 Daily inspection

Perform the following items during daily inspection of the air circuit filters:

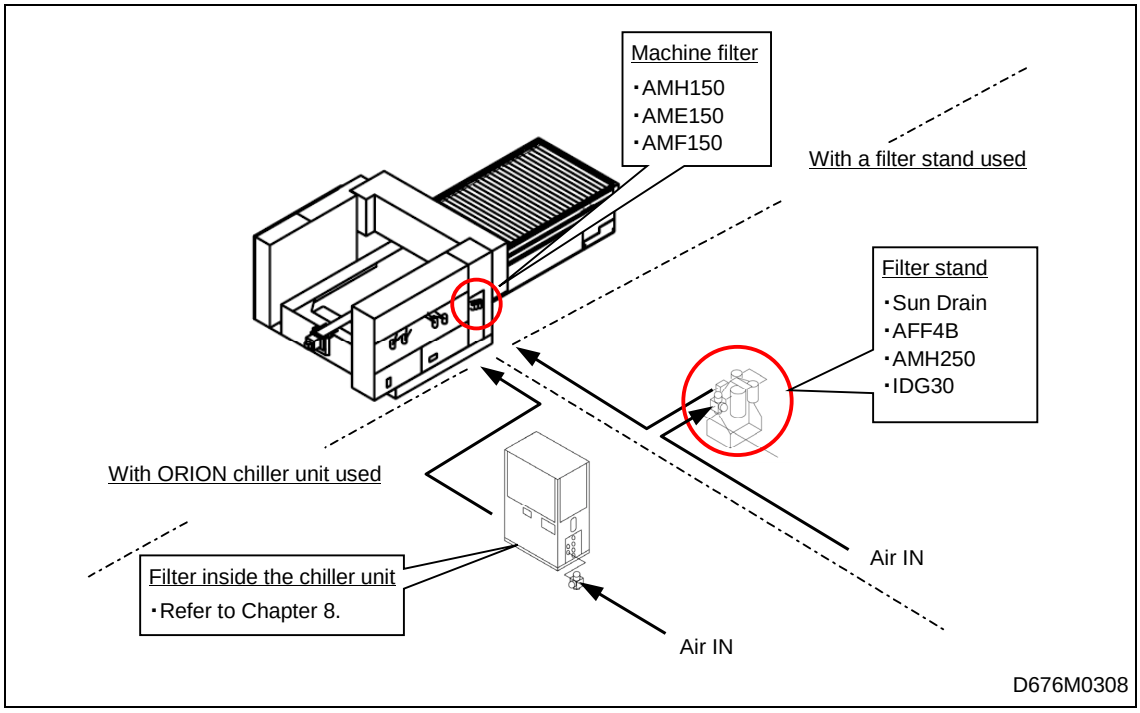


Fig. 7-66 Disposition of the air circuit filters

Table 7-2 List of the air circuit filters

Filter		Parts No.	Maker	Inspection item	Reference section
Machine	Micro mist separator	AMH150	SMC	Dirtiness of the filter elements	7-7-1, 1
				Checking the operation of the automatic drain	7-7-1, 3
	Super mist separator	AME150	SMC	Dirtiness of the filter elements	7-7-1, 1
	Odor-removable filter	AMF150	SMC	—	—
Filter stand	Sun Drain	Y301	Sanai	—	—
	Main line filter	AFF4B	SMC	Draining water from the filter	7-7-1, 2
	Micro mist separator	AMH250	SMC	Draining water from the filter	7-7-1, 2
	Air dryer	IDG30	SMC	Checking the dew-point checker	7-7-1, 4

1. Dirtiness of the filter elements

A. AMH150

Check whether machine alarm **283 DIRT OF AIR FILTER** is occurring. If this alarm is occurring, replace all filter elements as directed in Subsection 7-7-2, Paragraph 1.

B. AME150

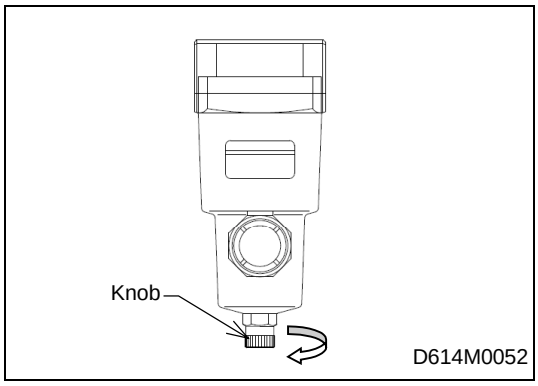
Check for red spots visible from the sight glass. If any red spots are visible, replace all filter elements as directed in Subsection 7-7-2, Paragraph 1.

2. Draining water from the filter

A. AFF4B, AMH250 (with drain cock)

Check whether the liquid level is visible from the sight glass. If the liquid level is visible, perform the following items:

(1) Fully rotate the knob counterclockwise (through about one and a half turns) to drain the water.

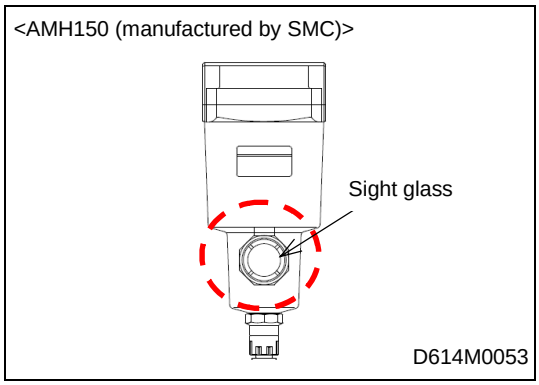


(2) Return the knob to its original position.

3. Checking the operation of the automatic drain

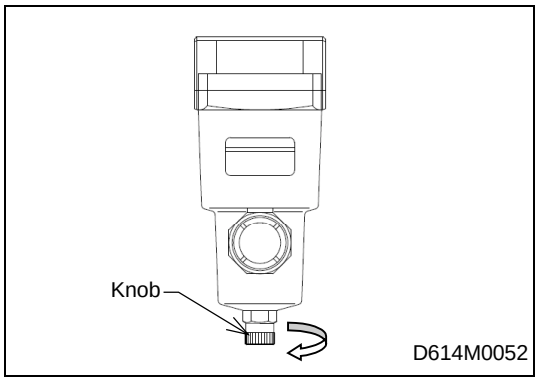
A. AMH150 (with automatic drain)

Check whether the liquid level is visible from the sight glass. If the liquid level is visible, perform the following items:



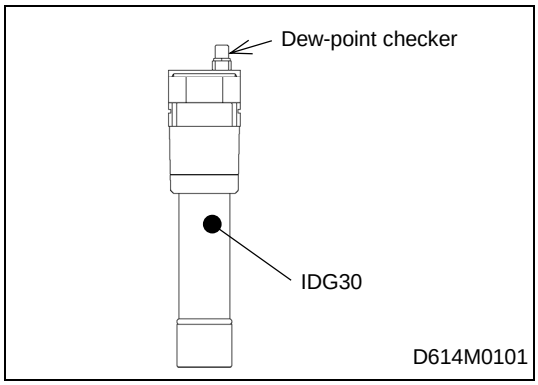
The automatic drain is not functioning when the casing contains water.

(1) Fully rotate the knob counterclockwise to drain the water.



If the water is not drained even so, the casing assembly may be in trouble. Replace the assembly.
Model: AMH-CA150C

4. Checking the dew-point checker



A. IDG30

During operation, closely observe the color of the grains within the dew-point checker and verify that the color is blue. Blue indicates that the membrane air dryer is functioning properly. If the color of the grains is either pink, white, or brown, this indicates a decrease in performance; replace the membrane module set in that case.

Table 7-3 Status of the membrane air dryer

Color of the grains in the dew-point checker	Dryer status
Blue	Normal
Pink, white, or brown	Decrease in performance

Note 1: It takes about one hour for the grains within the dew-point checker to react in color after air has been supplied.

Note 2: Return the air pressure to zero before attempting any maintenance steps.

7-7-2 Periodic inspection

1. Replacing the filter element (Machine)

A. Replacement timing

- Every 2000 hours of operation or when red spots appear on the access window for inspection (AME150)
- If filter replacement alarm **283 DIRT OF AIR FILTER** occurs

B. Types of filters to be replaced

- Machine air filter AMH150, AME150, AMF150 (manufactured by SMC)

C. Materials required

- Hexagon wrench
- Replacement filter elements

AMH-150EL (for AMH150)	G48SV002630
AME-150EL (for AME150)	G48SV002640
AMF-150EL (for AMF150)	G48SV002650

D. Directions

Replace all three elements at the same time.

(1) Close the main air ball valve and make sure that the regulator pressure has fallen to 0 MPa.

(2) Remove the screws securing the 3 filters installed on the side surface on the opposite side to the operator.

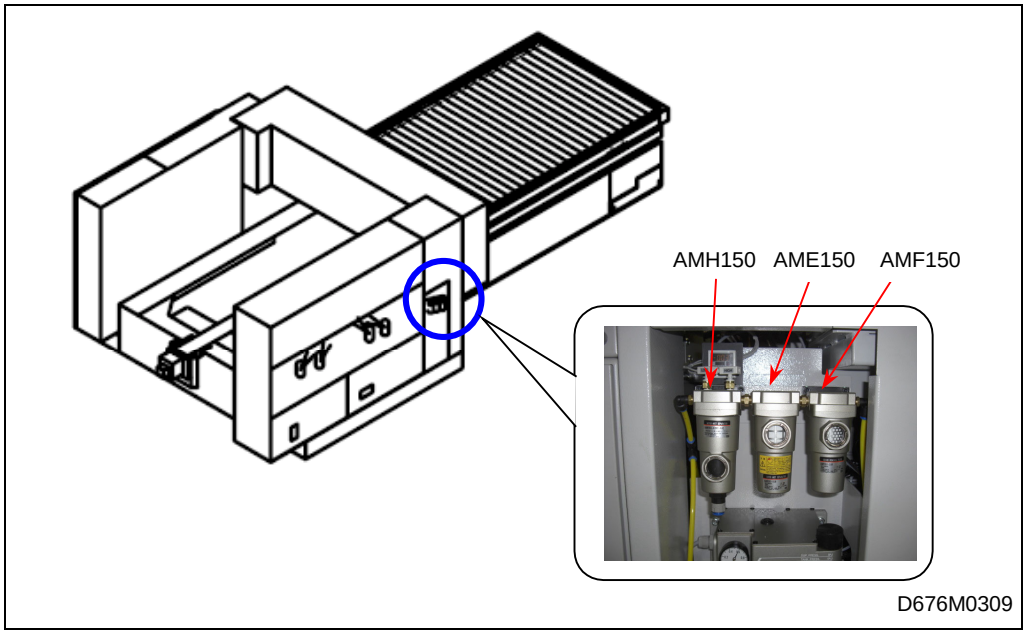


Fig. 7-67 Position of the air filter of the machine

(3) Replace the element, the O-ring, and the gasket.

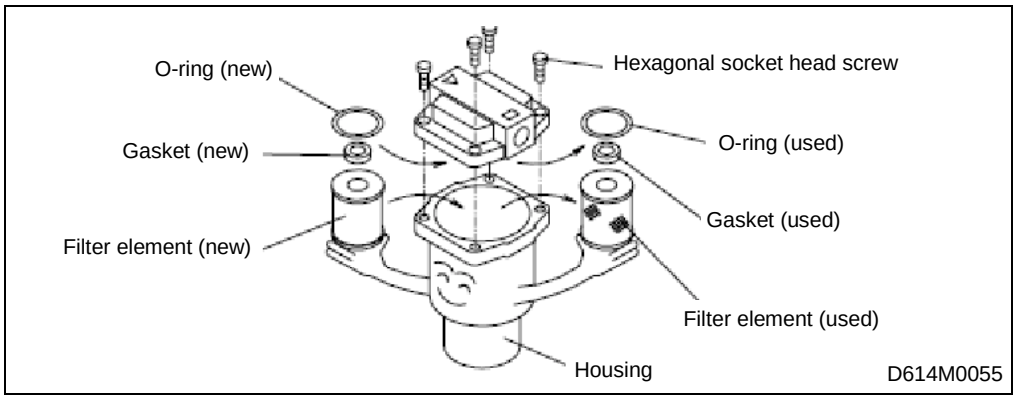


Fig. 7-68 Construction of the SMC filter

(4) Retighten the screws.

2. Replacing the filter element (for machines with a filter stand)

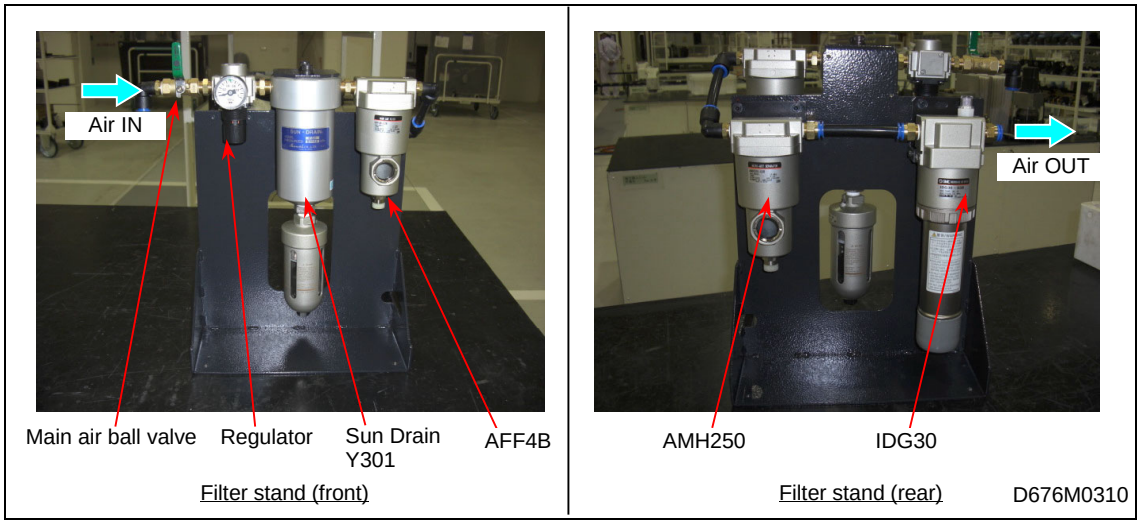


Fig. 7-69

A. Replacement timing

- Every 2000 hours of operation or when red spots appear on the access window for inspection (AME150)
- If filter replacement alarm **283 DIRT OF AIR FILTER** occurs

B. Types of filters to be replaced

- AFF4B, AMH250 (manufactured by SMC)

Replace the filter elements of the machine at the same time (refer to 1 above).

C. Materials required

- Hexagon wrench
- Replacement filter elements

AFF-FL4B (for AFF4B)	G48SV002660
AMH-250EL (for AMH250)	G48SV002690

D. Directions

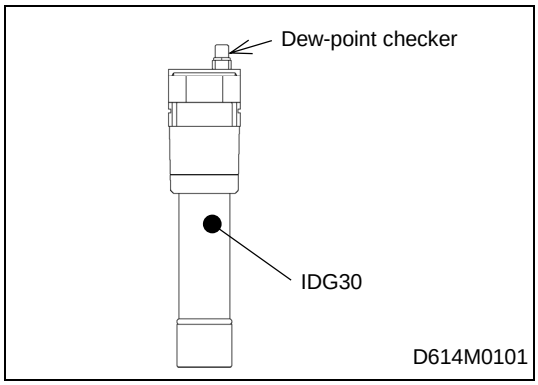
(1) Close the main air ball valve and make sure that the regulator pressure has fallen to 0 MPa.

(2) Remove the screws securing the filters.

(3) Replace the element, the O-ring, and the gasket (see Fig. 7-69).

(4) Retighten the screws.

3. Replacing the membrane module set and the dew-point checker (for machines with a filter stand)



A. Replacement timing

Replace the membrane module set as soon as possible after a color change to pink, white, or brown, in the dew-point checker.

B. Part to be replaced

IDG30 (manufactured by SMC)

C. Materials required

Name of the replacement part	Model	Part number
Membrane module set	IDG-EL30	G48SV003590
Dew-point checker	IDG-DP01	G48SV003600

D. Procedure for replacing the membrane module set

(1) Close the main air ball valve and make sure that the regulator pressure has fallen to 0 MPa.

(2) Loosen the holder.

(3) Lower the casing vertically and remove it from the body.

(4) Remove the old membrane module set from the casing.

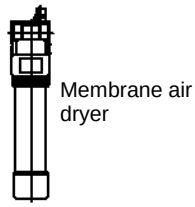
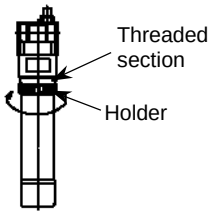
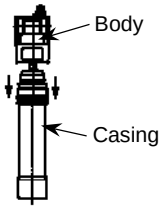
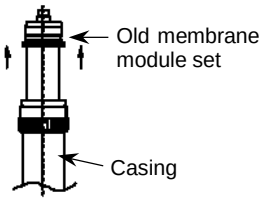
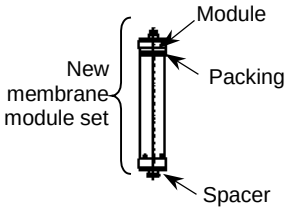
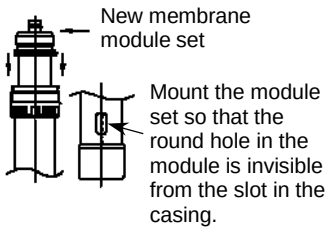
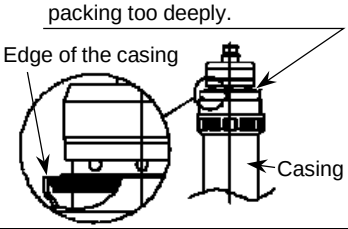
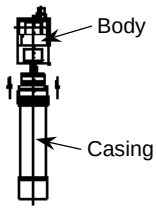
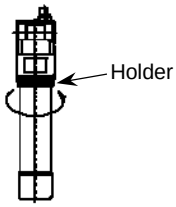
(5) Make sure that the new membrane module set to be used has a packing and a spacer.

(6) Hold the new membrane module set vertically and fully insert the module set into the casing.

(7) Fit the packing to the edge of the casing and set the packing.

(8) Insert the casing into the body vertically.

(9) Rotate the holder to screw it up into the body (the purging hole in the casing can face in any direction).

(1) Return the air pressure to zero. 	(2) Loosen the holder. 	(3) Remove the casing. 
(4) Remove the membrane module set. 	(5) Confirm the presence of a packing and a spacer. 	(6) Mount the new membrane module set. 
(7) Fit the packing. Fit the packing to the edge of the casing and set the packing. Be careful so as not to slide the packing too deeply. 	(8) Insert the casing. 	(9) Tighten the holder. 

4. Cleaning the water-removal filter (rotary receive type) (for machines with a filter stand)

A. Cleaning timing

Clean with each filter replacement.

B. Types of filters to be cleaned

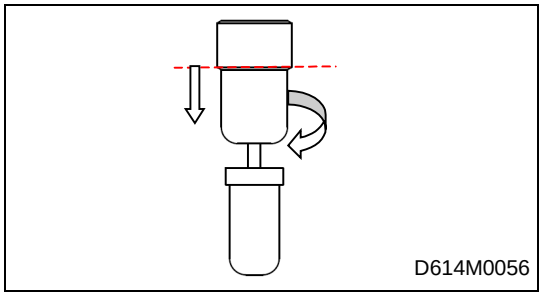
Sun Drain Y301 (Sanai)

C. Materials required

Cloth

D. Cleaning procedure

(1) Remove the filter by rotating the underside from the dotted line shown below.



(2) Wipe the inside with a clean cloth.

(3) Return the filter to its original position.

- NOTE -

8 CHILLER UNIT

8-1 Operation Preparations

CAUTION

- Described below is the operation preparation that applies to chillers manufactured by ORION Machinery. If a chiller other than those manufactured by ORION Machinery is used, follow its operating manual.

(1) Take off the tank inspection plate and supply water into the tank using a hose or bucket.

(2) Check the water level with the level gauge. There is no problem if the water level is between E and F. Add water if the water level is under E. Do not add water over F.

(3) After supplying water, bleed air from the piping in accordance with Subsection 8-3-2.

8-2 Chiller Unit Operations

For the specification and operation procedure of the chiller unit, refer to the separately supplied Operating Manual.

8-3 Maintenance of the Chiller Unit

CAUTION

- Described below is the maintenance work that applies to chillers manufactured by ORION Machinery. If a chiller other than those manufactured by ORION Machinery is used, follow its maintenance manual.

8-3-1 Water supply and drain

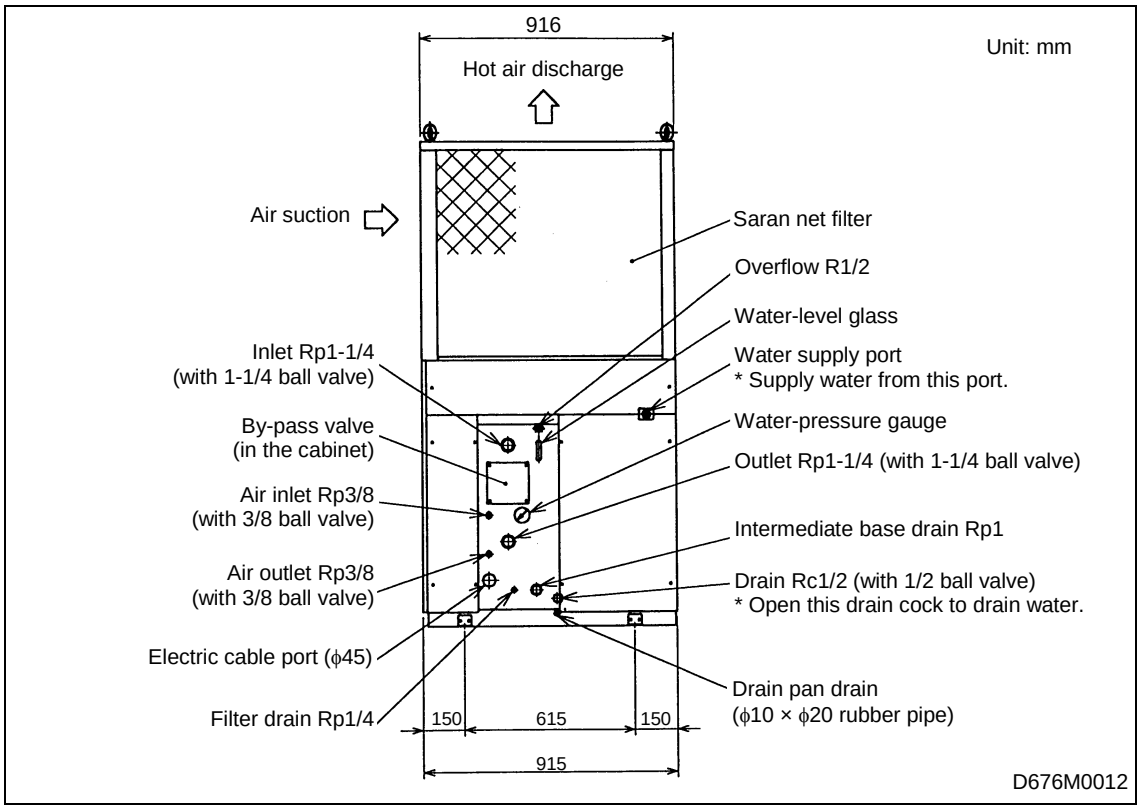


Fig. 8-1 Piping of the chiller unit (for 2.5 kW laser)

8-3-2 Bleeding air after supplying water to the chiller

CAUTION

- After changing water, be sure to bleed air by operating only the force-feed pump using the following procedures.
  Failure to bleed air before initiating normal operation will cause freezing due to the insufficiency of water in the heat exchanger and may thus result in serious trouble.

1. Procedure for operating only the force-feed pump

(1) Press the cooler run key while holding down the temperature control key "▲".

➔ The cooler power on/off indicator lamp will light up to indicate that the force-feed pump has started running.

➔ Digital display will alternate between "Pon" (pump on) and the measured water temperature value.

(2) After making sure that the indication on the pressure gauge is 0.4 MPa or less, let the pump run for about five minutes.

➔ If the pressure is over 0.5 MPa, the heat exchanger is likely to be frozen. If this is the case, remove the panel and check whether the heat exchanger is covered with frost (i.e. frozen).

➔ If the heat exchanger is frozen, please contact the manufacturer.

(3) Press the cooler run key once again.

➔ The cooler power on/off indicator lamp will go out to indicate that the force-feed pump has stopped running.
Operation only of the force-feed pump is now complete.

After this, proceed using the normal operating procedure.

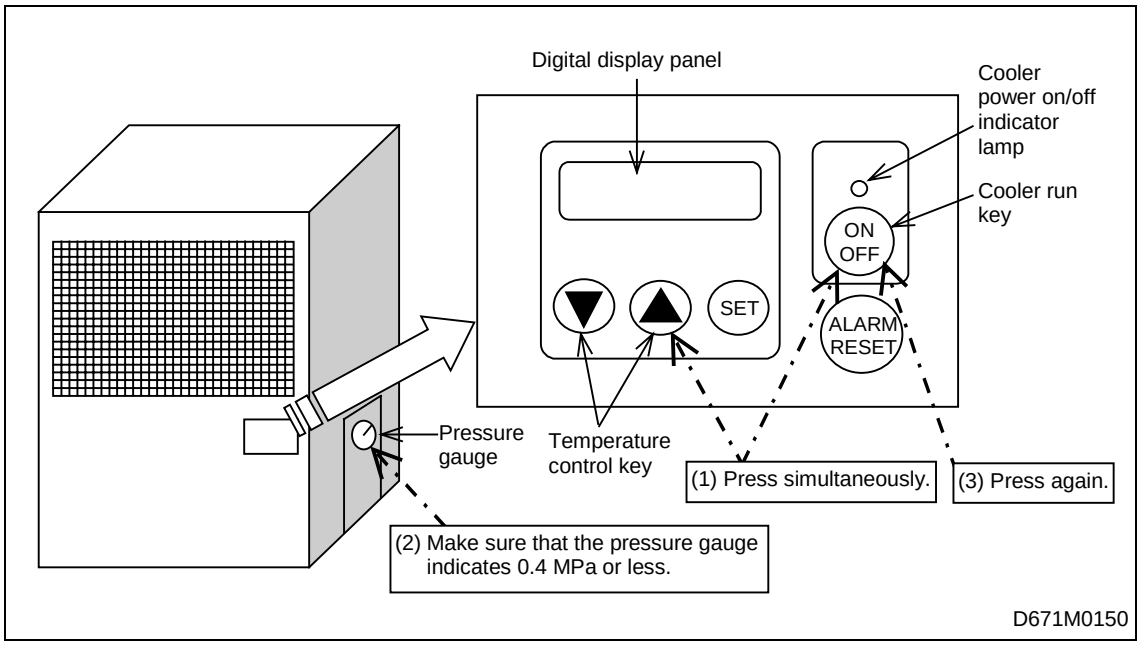


Fig. 8-2 Procedure for operating only the force-feed pump

8-3-3 Water treatment agent

In order to prevent the cooling water system from corroding or generating scales, algae, and slime, pour a water treatment agent into the water pan. Recommended agents are as follows:

1. Recommended water treatment agent

Table 8-1 Water treatment agent

Item \ Purpose	Rust preventive	Prevention from scales and slime
Name of agent	CONTLIME K-6000	CONTLIME MINI #30
Maker	DIA AQUA SOLUTIONS CO., INC.	
How much and how to pour agents	Pour as much CONTLIME K-6000 as the concentration becomes more than 2000 ppm, i.e. more than 200 g per 100 L (3.5 ft^3) of water after water is changed. Maximum concentration: 10000 ppm Reference: 2.5 kW machine - 500 cm^3 (31 in^3)	Sink a dedicated polyethylene container of 500 g CONTLIME MINI #30 per 100 to 300 L (3.5 to 10.6 ft^3) of water inside the chiller tank and fix it with a wire. It dissolves out little by little due to the work of the special filter.
How often to change	Every 3 months After water is changed, add treatment agent again.	

2. How to secure the CONTLIME MINI #30

CAUTION

- Fix the CONTLIME MINI #30 container, as shown in the figure below. Before starting the machine, check to make sure that the CONTLIME MINI #30 is fixed securely. Otherwise, the CONTLIME MINI #30 may block the suction port of the pump, causing the heat exchanger to freeze and the machine to break down.

To prevent the CONTLIME MINI #30 from sinking to the bottom of the tank, wind one end of wire around the CONTLIME MINI #30 and hook the other end on the upper edge of the tank.

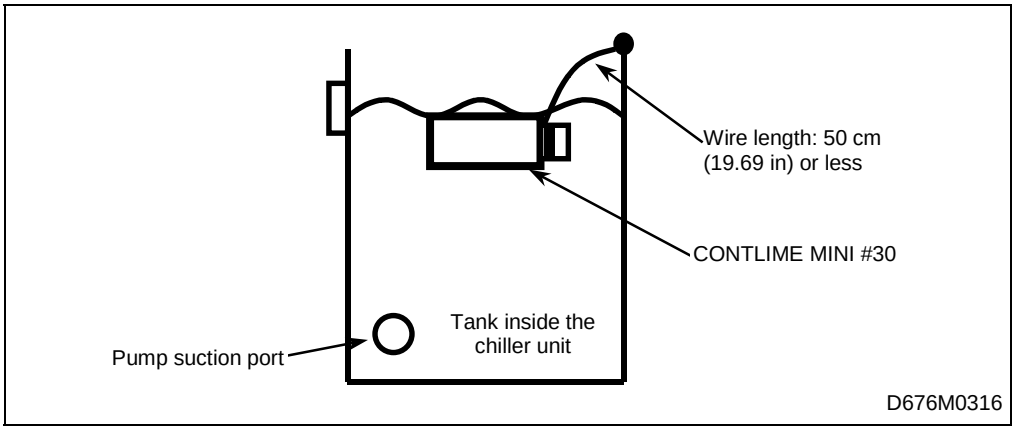


Fig. 8-3 Securing the CONTLIME MINI #30 container

8-3-4 Cleaning the chiller unit

Clean as follows to remove any slimes, potentially corrosive products, and scales sticking to the cooling water system:

1. Recommended cleaning agent

DESLIME (Trade name of the slime removers manufactured by DIA AQUA SOLUTIONS CO., INC.)

Table 8-2 Ordering product numbers of the DESLIME Series

Name of the product	Product No.	Remarks
DESLIME Set	56099203500	Complete with DESLIME-related products (including the 3 products below)
DESLIME	Z50ZZ00244A	20-kg (44-lbs) plastic can
DESLIME F Tester	Z50ZZ00244B	Hydrogen peroxide concentration test paper, 100 sheets × 1 bottle
Dia-Super EZ	Z50ZZ00244C	Hydrogen peroxide decomposition enzyme 1 L (0.035 ft^3) × 12 pieces × 1 carton

2. Body protection

Be absolutely certain to wear the following protection when cleaning:

- Hand protection: Rubber gloves
- Eye protection: Safety glasses (goggles), protection shield

3. Cleaning

CAUTION

- Always clean in a place that is adequately ventilated and free from burning object such as hot stoves or cigarettes.

(1) Drain 20 L (0.70 ft^3) of water from the chiller unit.

(2) Fill the water tank with the DESLIME from the water supply port.

Note: During filling with the DESLIME, supply it in several split operations and slowly to prevent overflowing.

Table 8-3 Supply volume of the DESLIME (when a standard concentration ranges from 5% to 10%)

Laser output	Supply volume of the DESLIME
1.8 kW/4.0 kW	1 can (20 kg or 44 lbs)
2.5 kW	2 cans (40 kg or 88 lbs)

(3) Operate the laser machine for two hours in succession under a 50% oscillation status of its rated output (i.e., 1250 W command oscillation in the case of 2.5 kW machine specifications).

➔ Chiller unit cleaning is started.

(4) After stopping the chiller and the oscillator, supply 1 L (0.035 ft^3) of hydrogen peroxide decomposition enzyme (Dia-Super EZ) from the water supply port to the water tank.

Note: During filling with the decomposition enzyme, supply it in several split operations and slowly to prevent overflowing.

(5) Operate the laser machine for one hour in succession under the oscillation status mentioned in above step (3).

➔ The DESLIME is decomposed.

(6) After stopping the chiller and the oscillator, use hydrogen peroxide concentration test paper (DESLIME F Tester) to make sure that the DESLIME has been decomposed.

Original color of the test paper:	Light yellow
After decomposition of the DESLIME:	Light yellow or yellowish green
If the DESLIME remains undecomposed:	Dark green or blue

(7) Open the drain cock on the chiller to discharge its contents into an empty drum can.

(8) After the discharge, supply water up to the required level.

(9) Operate the laser machine for 20 minutes under the oscillation status of step (3) with no DESLIME supplied.

(10) Once again, discard the contents of the chiller into an empty drum can, as in step (7), and then supply water to complete the cleaning procedure.

- After the water-supplying operation, bleed air from the pipeline as directed in Subsection 8-3-2. If the water is turbid, repeat steps (7) to (10) two to three times.

(11) Add the recommended water treatment agent using the procedure laid down in Subsection 8-3-3.

4. DESLIME discarding

A. Discarding the can of the DESLIME

(1) Wash the DESLIME-containing can in water.

(2) Detach the label from the can.

(3) Discard the can of the DESLIME into the designated trash-dumping area.

B. Disposing of the discharged water after treatment using DESLIME

(1) Properly sewage-treat the discharged water before draining it.

Note: Before draining the discharged water, be sure to sewage-treat it. If it is drained intact, this could adversely affect the ecosystems such as aquatic plants and animals.

5. Cleaning interval

Every three months.

8-4 Antifreeze

CAUTION

- Described below is the operation procedure that applies to chillers manufactured by ORION Machinery. If a chiller other than those manufactured by ORION Machinery is used, follow its operating manual.

If the laser machine is used in a cold area, add antifreeze into the chiller liquid.

1. Recommended antifreeze

AURORA BRINE (Tokyo Fine Chemical Co. Ltd.)

2. How to use

Add antifreeze so that the concentration of the tank water becomes 30% which is enough to freeze down to –10°C (14°F). Do not use antifreeze together with any other water treatment agent because it already contains corrosive agent. Even though the ambient temperature goes down more, keep the maximum concentration up to 40% (freezing temperature is –15°C or 5°F) and use the agent only during winter. Dropping concentration too much reduces cooling ability. If the ambient temperature drops under –15°C or 5°F, do not stop the chiller operation.

Reference: Capacity of chiller tank

1.8 kW machine:	140 L (4.94 ft^3)
2.5 kW machine:	270 L (9.53 ft^3)
4 kW machine:	160 L (5.65 ft^3)

8-5 Quality of Cooling Water

Use the water which conforms to the following water quality standard:

Table 8-4 Water quality

Item			Unit	Standard value
Standard items	pH (25°C or 77°F)			6.0 to 8.0
	Conductivity (25°C or 77°F)		μs/cm	300 or less
	Chloride ion	Cl^-	mg/L	50 or less
	Sulphate ion	SO_4^{2-}	mg/L	50 or less
	Acid consumption (alkalinity) (pH 4.8)	$CaCO_3$	mg/L	50 or less
	Total hardness	$CaCO_3$	mg/L	70 or less
	Calcium hardness	$CaCO_3$	mg/L	50 or less
	Ionic state silica	SiO_2	mg/L	30 or less
Reference items	Iron	Fe	mg/L	0.3 or less
	Copper	Cu	mg/L	0.1 or less
	Ammonium ion	NH_4^+	mg/L	1.0 or less
	Sulfide ion	S^{2-}	mg/L	It must not be detected.
	Residual chloride	Cl	mg/L	0.3 or less
	Free carbon	CO_2	mg/L	4.0 or less

Note 1: Normal service water is satisfied with the above standard. However, some districts may bear greater values. In such a case, we recommend you use distilled water.

Note 2: Never use industrial water or underground water for this purpose.

8-6 Cleaning and Replacing Filter Elements

CAUTION

- Described below is the operation procedure that applies to chillers manufactured by ORION Machinery. If a chiller other than those manufactured by ORION Machinery is used, follow its operating manual.

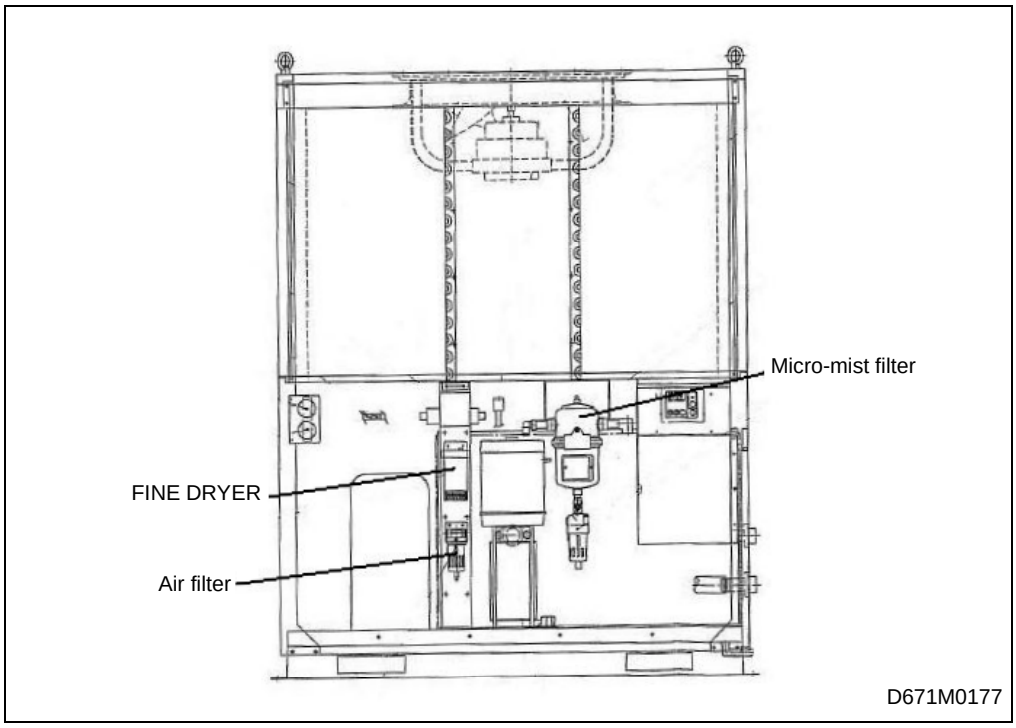


Fig. 8-4 Filter positions (1.8 kW)

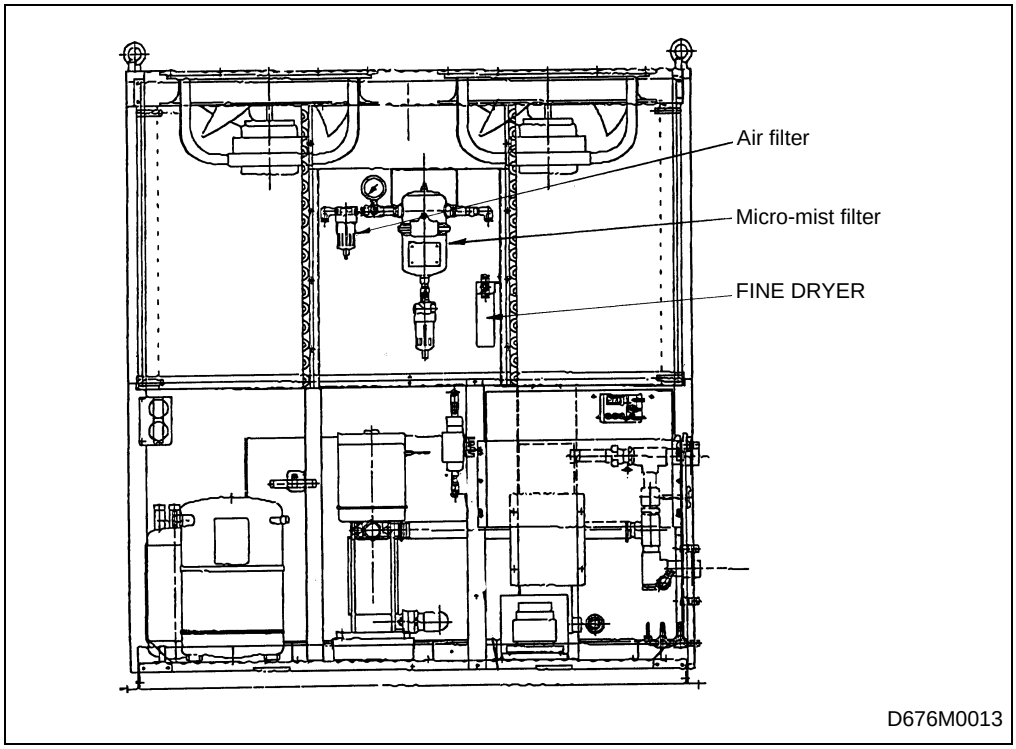


Fig. 8-5 Filter positions (2.5 kW)

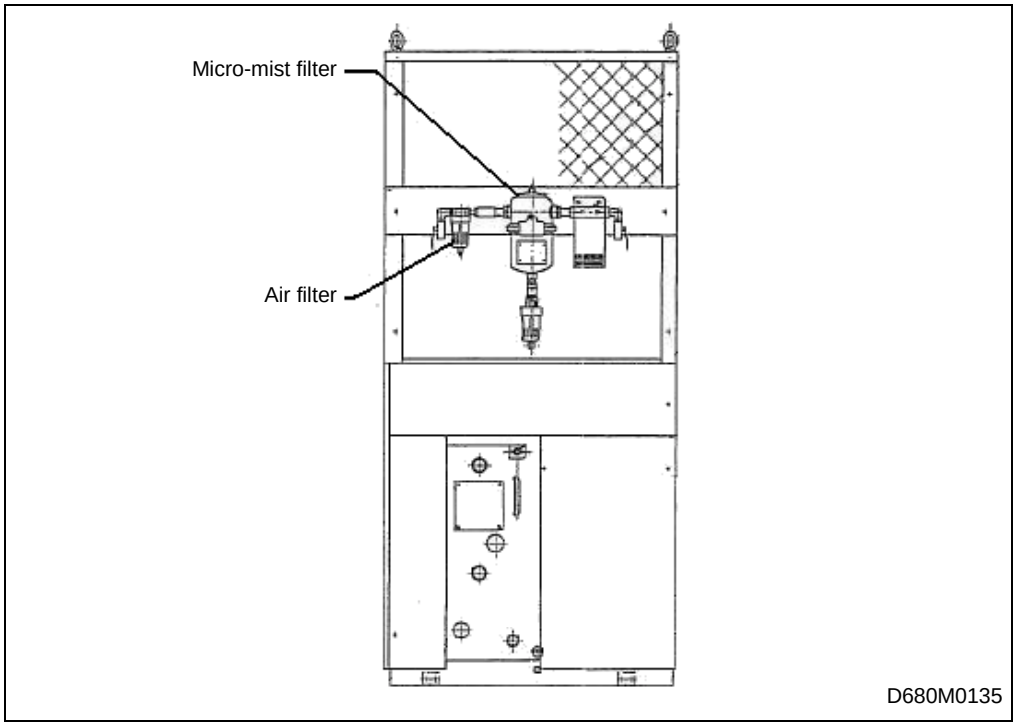


Fig. 8-6 Filter positions (4.0 kW)

8-6-1 Inspecting the micro-mist filter

1. Inspection interval

Every day

2. Inspection

Visually check the following items:
- Isn't there any air leakage?
- Does the drain function properly (to drain water)?

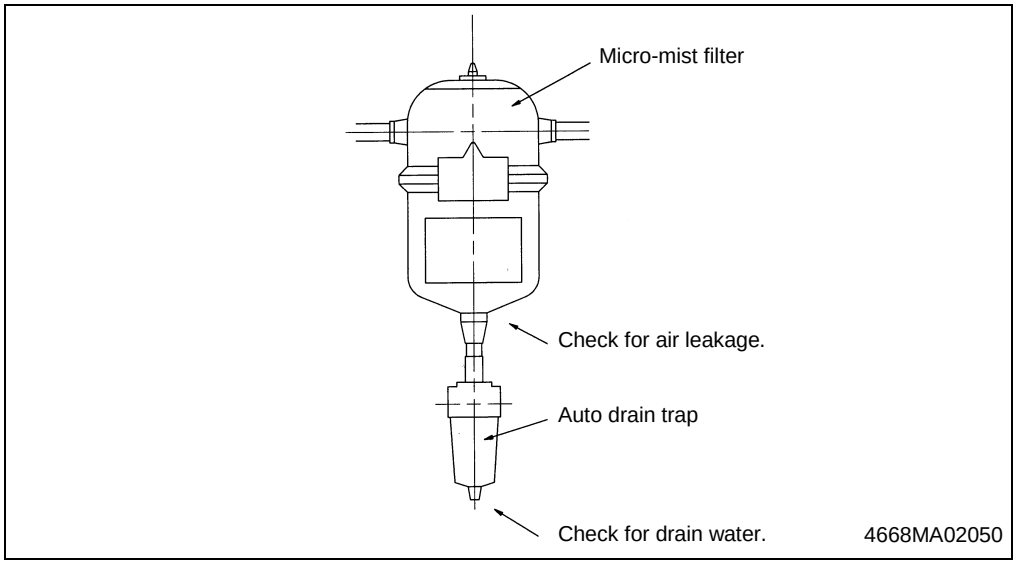


Fig. 8-7 Inspecting the micro-mist filter

8-6-2 Cleaning the auto drain trap

1. Cleaning interval

Every week

2. Cleaning procedure

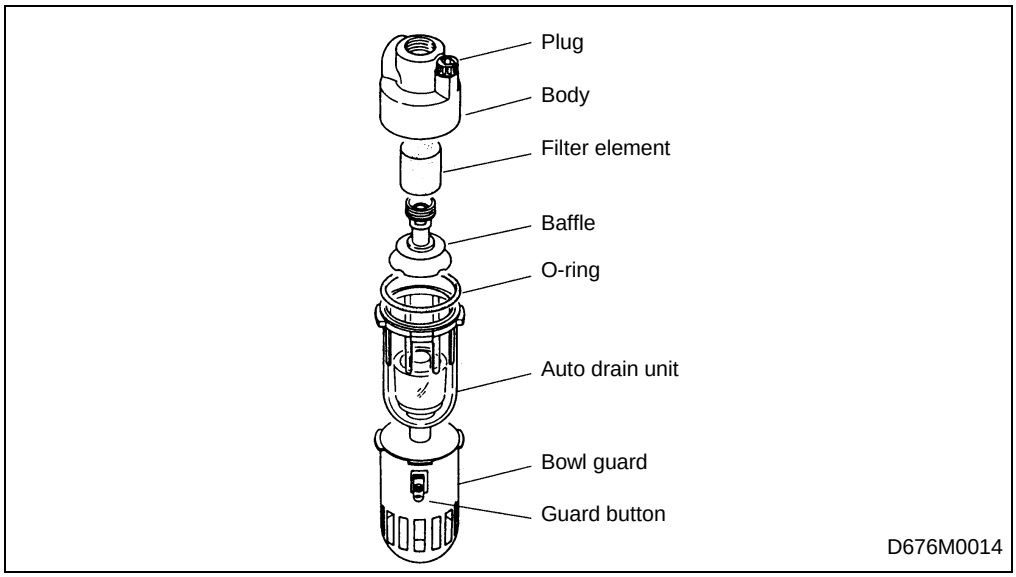
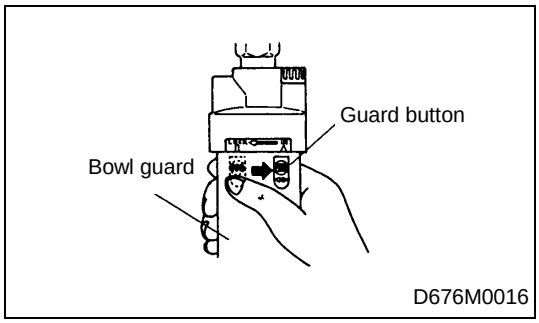


Fig. 8-8 Composition

(1) Close the ball valve at the air inlet of the chiller.

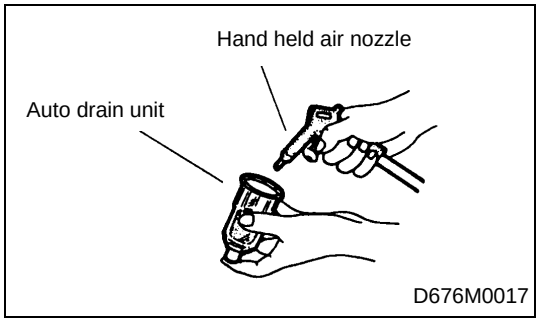
(2) Make sure that secondary pressure (regulator pressure) at the air outlet of the chiller has fallen to 0 MPa.

(3) Pressing the guard button of the auto drain trap, turn the bowl guard from the “LOCK” to “IN” position.

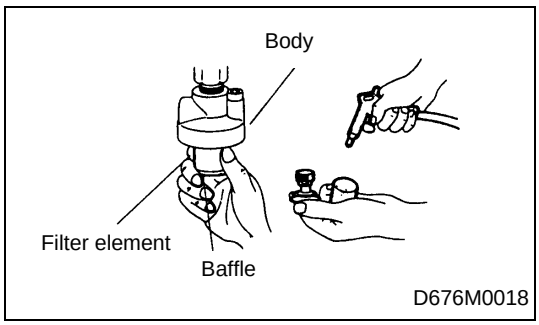


(4) As the bowl guard and the bowl are now separable, remove dust from the screen provided at the bottom of the auto drain unit using a hand held air nozzle or the like.

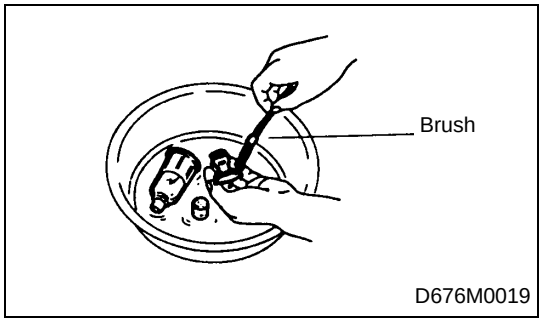
Note: Do not disassemble the auto drain unit. It will be damaged if forcibly disassembled.



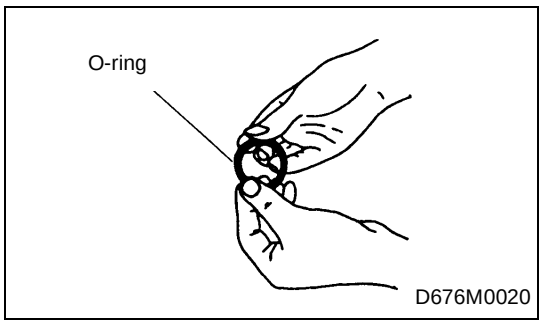
(5) Remove the baffle from the body and remove dust from the filter element and the baffle using a hand held air nozzle or the like.



(6) Wash each disassembled part with water and then wipe it with clean cloth.

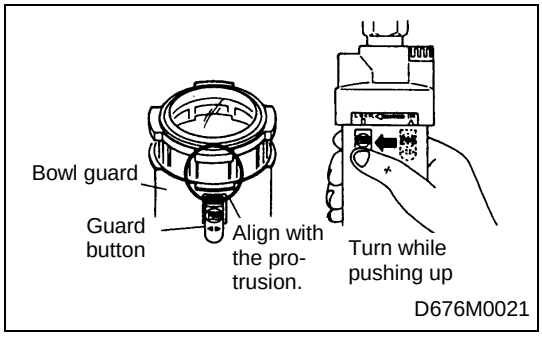


(7) Check for any broken part.
Carefully check the O-ring.



(8) Reverse the order of disassembly for re-assembly.

1) Assemble the filter element and the baffle on the body.
2) Place the auto drain unit in the bowl guard.
3) Adjust the guard button at the “IN” position.
4) While pushing up the bowl guard, turn it until the guard button is at the “LOCK” position.



Note 1: Turn the bawl guard for reassembly until a “click” sound is heard, which indicates the guard is securely locked.

Note 2: The bowl could be broken if the following materials are contained in the drain or atmosphere, or it is exposed to direct sun light.

- Phosphoric ester base operating fluid
- Organic solvent (aromatic or chlorine base hydrocarbon compound): Benzene, toluene, phenol, trichlene, gasoline, thinner, etc.
- Sulfur dioxide gas, chlorine gas, freon gas
- Acids: Hydrochloric acid, sulfuric acid, acetic acid, benzoic acid, etc.

8-6-3 Replacing the filter element

1. Replacing interval

When the differential pressure switch turns on or every 2000 hours

2. Type

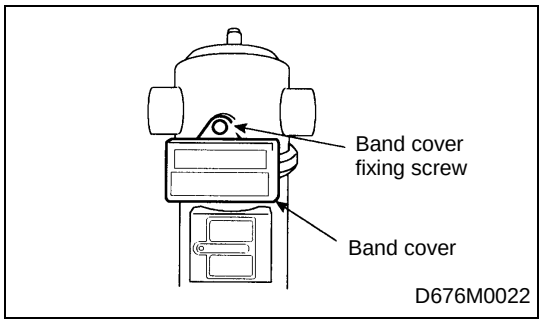
Micro filter element (EMS400): 1 pc. U01QQ002500

3. Replacing procedure

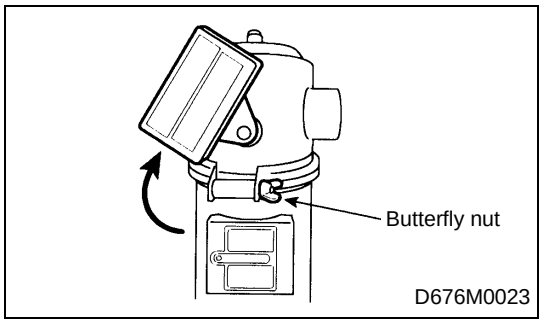
(1) Bleed compressed air from the pressure vessel.

(2) Remove the housing.

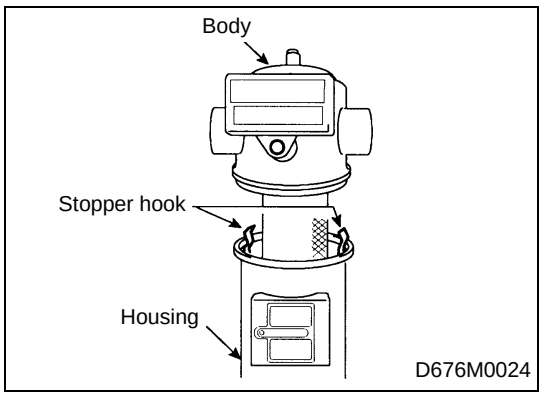
1) Loosen the band cover fixing screw and confirm air has been bled from the container. If the screw is loosened without air bleed, air will be bled through the tapped hole.



2) Turn the band cover by 180 degrees and loosen the butterfly nut on the band.



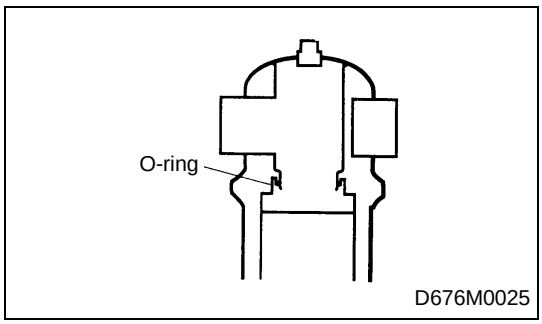
3) Remove the band and pull the hosing down so that the inner stopper hook will come off.



(3) Replace the element.

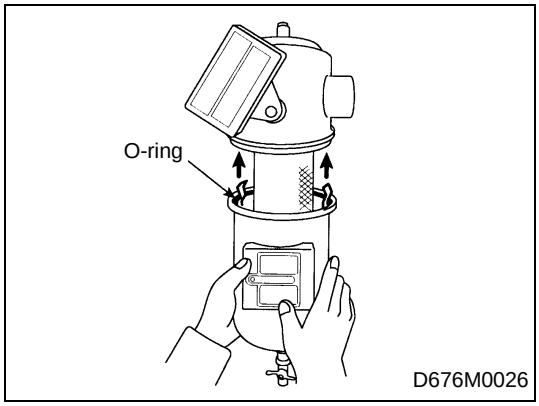
1) Pull the inside element downward.

2) Attach an O-ring on the head cover of new element and insert the element in the body.



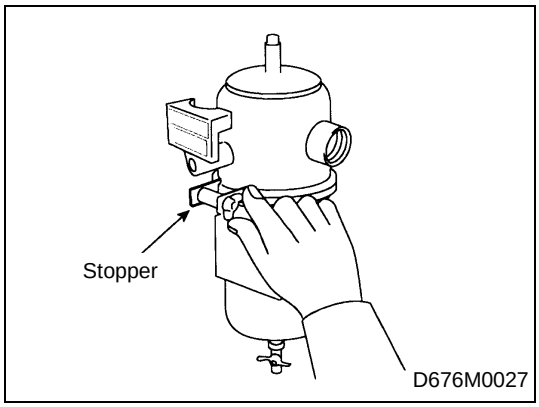
(4) Install the housing.

1) Fit an O-ring on the housing and push the housing upward till the hook is engaged.



2) When applying the band, adjust the band cover fixing screw at the center of the band tightening section.

3) Tighten the butterfly nut till it cannot be turned any more by the stopper.



8-7 Disposal of Refrigerant

The chiller unit uses HFC (alternative Freon) as the refrigerant. The law of each country makes it mandatory that HFC (alternative Freon) must be reclaimed and disposed of in accordance with applicable laws and regulations. Therefore, when disposing of the chiller unit, contact a toxic industrial waste collector to reclaim and dispose of alternative Freon properly.

Note: If you cannot find an appropriate toxic industrial waste collector, contact Mazak Technical Center or Technology Center. Upon request, we will make necessary arrangements for the disposal at your cost.

9 SERVO FOCUS TORCH

9-1 Outline

The Servo Focus torch has the Programmable Focus Positioning function.

Using this function, focus position can be changed rapidly and with high precision during machining by means of commands in the program. This allows piercing and cutting to be realized continuously. In addition, piercing time can be reduced significantly for improved productivity.

9-2 Specification

Item		Specification		Remarks
Lens to be used		ϕ2" × 7.5"	ϕ2" × 5"	
Applicable nozzles and variations in N.F (Unit: mm (in))	ϕ1.2 (ϕ0.047)	–6.1 ≤ N.F ≤ 5 (–0.24 ≤ N.F ≤ 0.20)	–3.5 ≤ N.F ≤ 5 (–0.14 ≤ N.F ≤ 0.20)	The limits of the N.F (see Note 1) depend on the type of nozzle and lens to be used.
	ϕ1.5 (ϕ0.059)	–8.0 ≤ N.F ≤ 5 (–0.31 ≤ N.F ≤ 0.20)	–4.8 ≤ N.F ≤ 5 (–0.19 ≤ N.F ≤ 0.20)	
	ϕ2.0 (ϕ0.079)	–9.3 ≤ N.F ≤ 5 (–0.37 ≤ N.F ≤ 0.20)	–5.0 ≤ N.F ≤ 5 (–0.20 ≤ N.F ≤ 0.20)	
	ϕ2.5 (ϕ0.098)	–11.5 ≤ N.F ≤ 5 (–0.45 ≤ N.F ≤ 0.20)	–6.2 ≤ N.F ≤ 5 (–0.24 ≤ N.F ≤ 0.20)	
	ϕ3.0 (ϕ0.12)	–13.5 ≤ N.F ≤ 5 (–0.53 ≤ N.F ≤ 0.20)	–7.2 ≤ N.F ≤ 5 (–0.28 ≤ N.F ≤ 0.20)	
	ϕ3.5 (ϕ0.14)	–15.5 ≤ N.F ≤ 5 (–0.61 ≤ N.F ≤ 0.20)	–8.1 ≤ N.F ≤ 5 (–0.32 ≤ N.F ≤ 0.20)	
	ϕ4.0 (ϕ0.16)	–17.6 ≤ N.F ≤ 5 (–0.69 ≤ N.F ≤ 0.20)	–9.1 ≤ N.F ≤ 5 (–0.36 ≤ N.F ≤ 0.20)	
Withstand pressure limits (Assist gas)		2.5 MPa (see Note 2)		—
Lens cooling system		Air-cooling		—
Type of profiling unit		MAZAK non-contact profiling unit (electrostatic capacity type)		This unit cannot be used for nonmetallic materials.

Note 1: N.F (nozzle focus) denotes the distance from the leading end of the nozzle to the focus.

Note 2: To obtain a pressure of 2.0 MPa for using the ϕ3 mm (ϕ0.12 in), ϕ3.5 mm (ϕ0.14 in) or ϕ4.0 mm (ϕ0.16 in) nozzle, it is necessary to provide optional third/fourth gas piping (2.5 MPa) and ensure a main valve pressure of 2.5 MPa.

9-3 Construction

Servo Focus torch consists of following parts:

1. Servo Focus torch (for 7.5" lens) 1 set
2. Jig
   - Lens-fastening jig 1 pc.
   - Nozzle clamp-fastening jig 1 pc.
   - Nozzle mounting jig 1 pc.

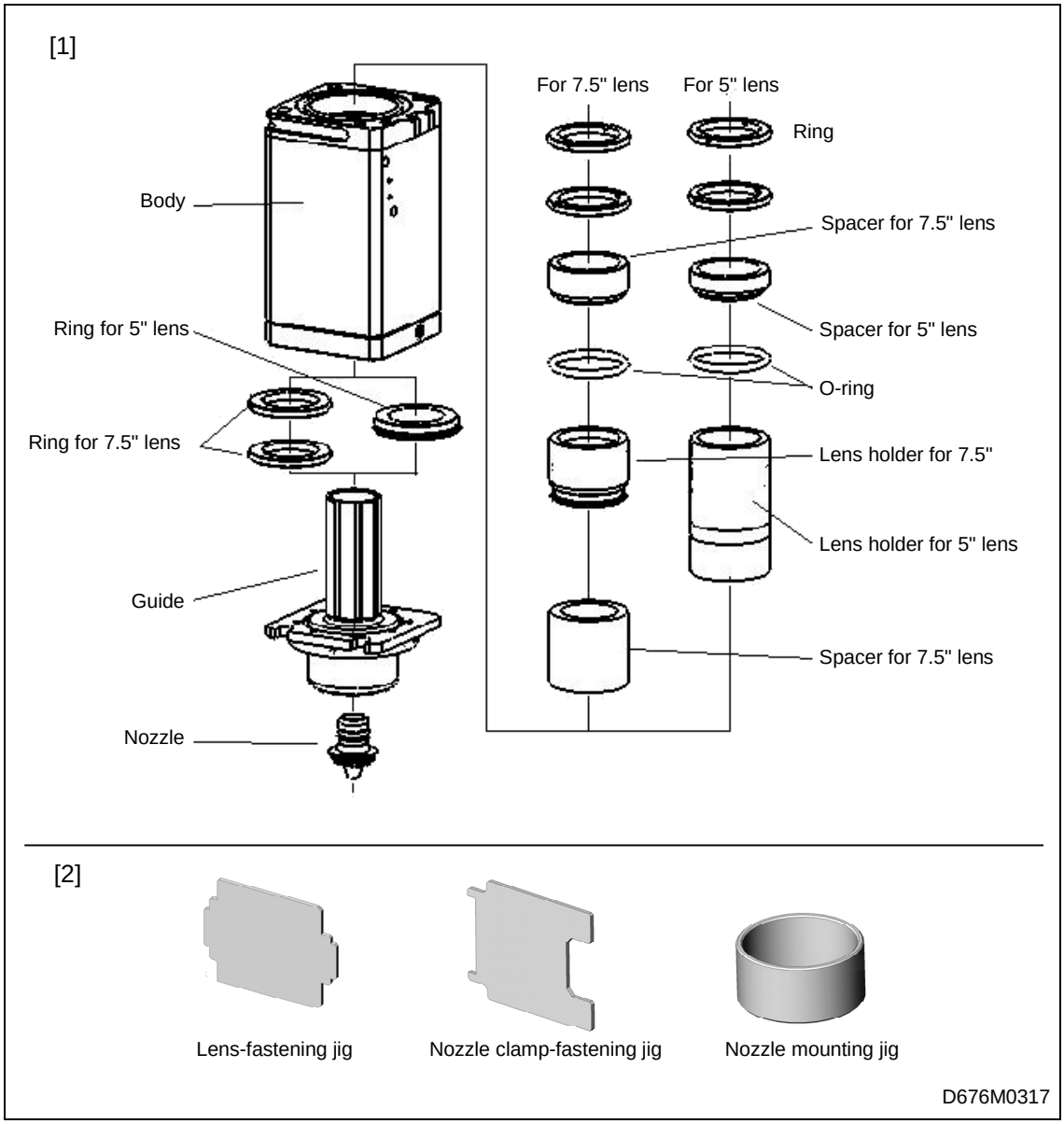


Fig. 9-1 Configuration of Servo Focus torch components

9-4 Functions

1. Focus control by programming

The distance from the leading end of the nozzle to the focus is referred to as the nozzle focus (N.F).
The Servo Focus torch unit allows the optimum N.F to be set by specifying any N.F in the program.

2. Quick torch mounting and dismounting

Unlike conventional torches, this new torch not requiring any piping can be readily connected to the main unit of the laser beam machine.

3. Non-contact profiling

The distance from the front end of the nozzle to the worksheet is referred to as the nozzle worksheet, which is expressed as N.W.

The clearance (distance) between the workpiece and the nozzle during machining can be maintained at any value by connecting the torch to the laser machine and then specifying that N.W value in the program.

9-5 Preparation before Machining

This section lays down all procedures from lens holder disassembly and reassembly to lens positioning and fastening.

9-5-1 Removing the lens holder section

As shown below, remove the upper rings using the required lens-fastening jig, then turn the torch upside down, and remove the spacer, the O-ring, the lens holder, and the spacer for 7.5" lens.

Required tools: Lens-fastening jig

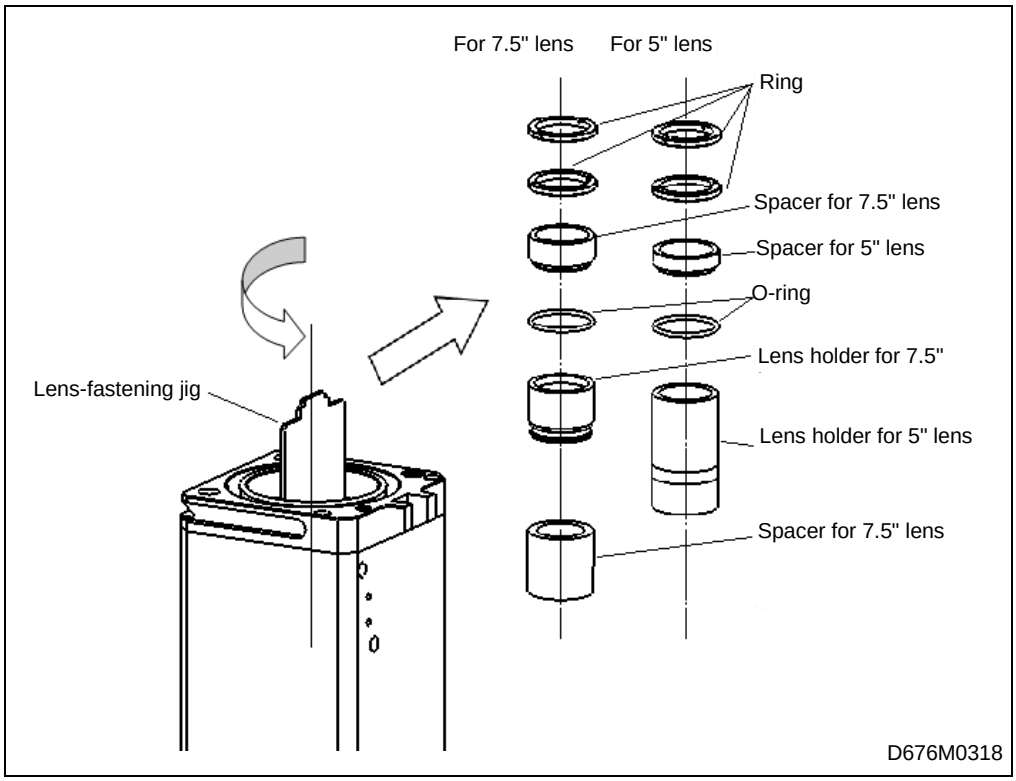


Fig. 9-2 Disassembling the torch

9-5-2 Replacing the lens

Use the procedure below to mount/replace or clean the lens. The lens holder required differs according to the kind of lens used, because the lens curvature varies with the kind of lens used. For this reason, use the required lens holder.

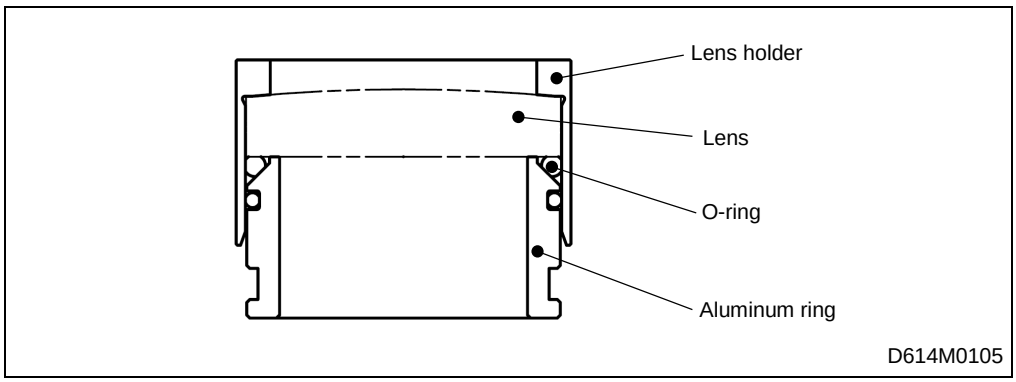


Fig. 9-3 Construction of the lens holder

Discriminate the lens holder by its overall length and by the position of the stepped section on the outer surface of the lens holder.

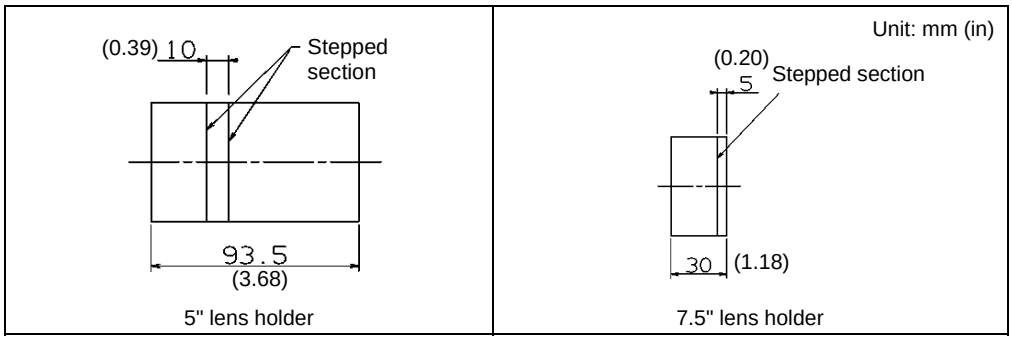


Fig. 9-4 Discriminating the lens holder

<Procedure>

(1) Hold the lens holder upside down and pull out the aluminum ring.

(2) Remove the O-ring.

(3) Mount the aluminum ring after the O-ring has been removed.

(4) Lift the aluminum lens holder.

(5) As required, replace or clean the lens.

(6) Reverse the above procedure from step (4) to reassemble the lens holder.

Note: When disassembling the lens holder, hold it firmly with both hands. Also, be sure to use the above procedure. The use of a wrong procedure could create the chance of the lens being dropped or hit to damage.

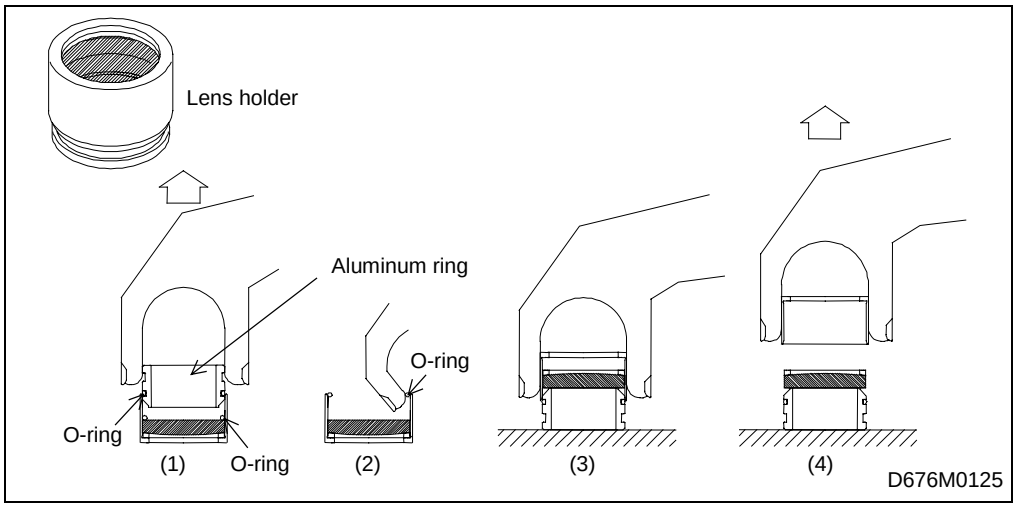


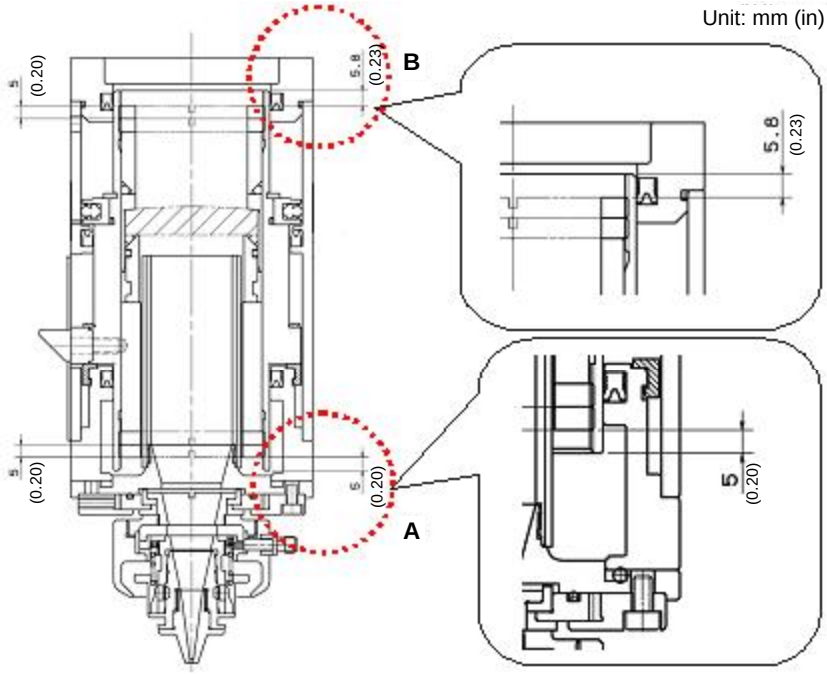
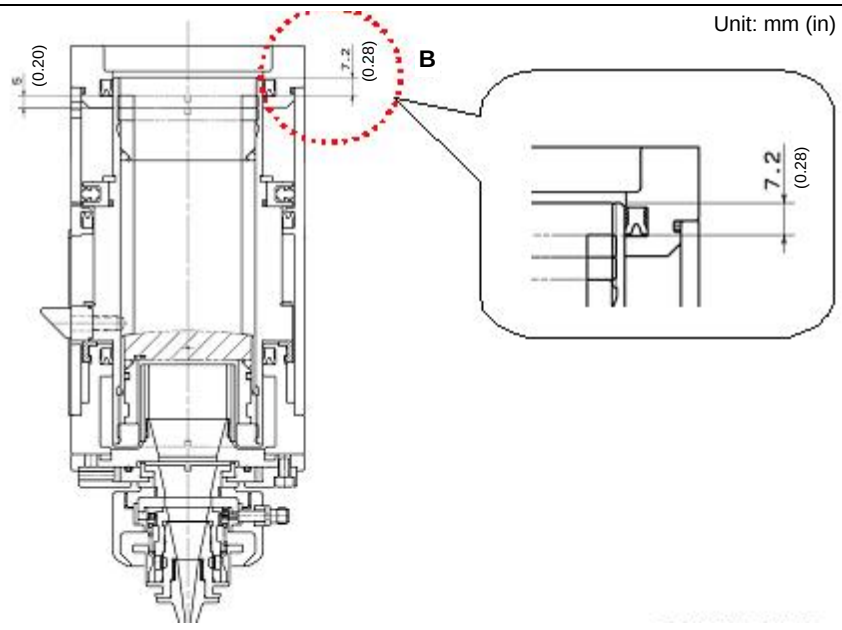
Fig. 9-5 Disassembling the lens holder

9-5-3 Mounting the lens holder on the torch

The reference position for mounting the lens holder on the torch is shown below. If the lens holder is not mounted in this reference position, an alarm will occur to indicate that the focal distance automatic measuring and correcting function does not operate properly. For mounting in the reference position, perform adjustments for reference dimension **A** to match the value shown below.

<Lens holder mounting reference position>

Mount the lens holder so that reference dimension **A** matches the value shown below. This dimension is for a pressure-resistant lens with a withstand pressure of 2.0 MPa and a lens end thickness of 0.38". Be careful that if the lens thickness changes, the reference dimension must also be correspondingly adjusted.

	Assembly drawing
7.5" Mazak High accuracy Lens (Withstand pressure: 2.0 MPa, Lens end thickness: 0.38 in)	Unit: mm (in)  D614M0319
5" Mazak High accuracy Lens (Withstand pressure: 2.0 MPa, Lens end thickness: 0.38 in)	Unit: mm (in)  D614M0320

1. Mounting the lens holder on the torch

Assemble the required parts into the torch body using the reverse procedure as shown in Fig. 9-2 in Subsection “9-5-1 Removing the lens holder section”.

Required tools: Allen wrench and lens-fastening jig

(1) Collapse the O-ring so that there is no clearance between the lens holder and the aluminum ring. See figure below.

CAUTION

- See to it that the O-ring does not protrude.
- Assemble the parts into the torch body using the correct procedure. Incorrect procedure may cause the lens to be damaged.

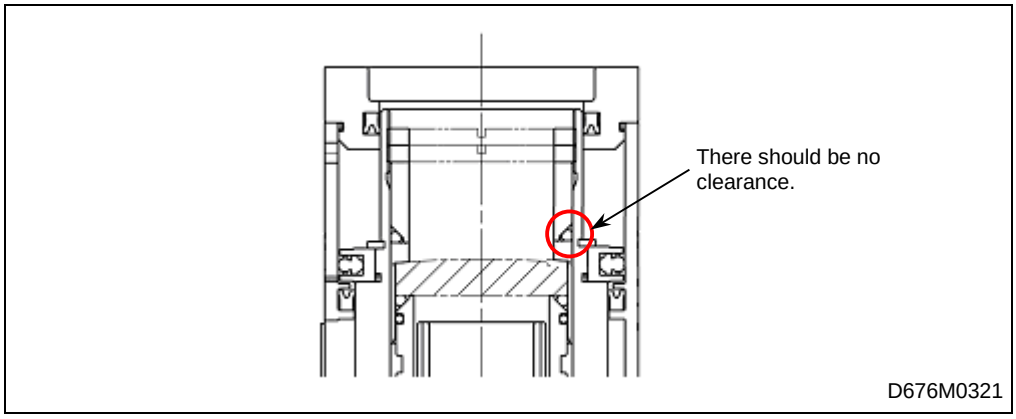


Fig. 9-6 Fastening lens

2. Measuring and adjusting reference dimension A

Note: Part of the Servo Focus torch differs according to the type of lens used. The lens holder adjustment procedure itself, however, is the same.

(1) Remove the front end of the torch.

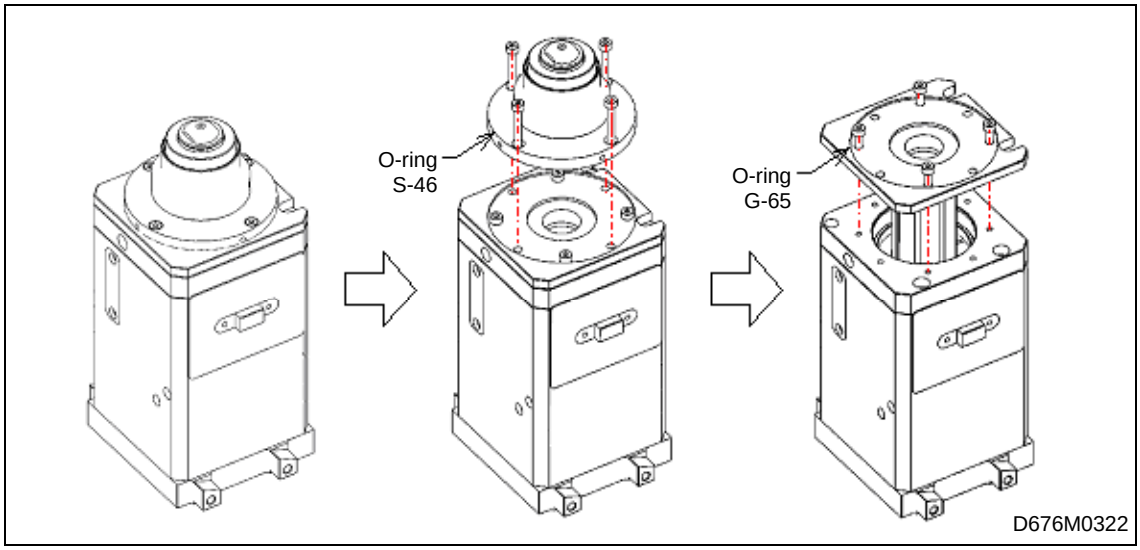


Fig. 9-7

Note: Two O-rings are contained. Save both for later use during reassembly.

(2) Direct the top of the torch downward, then place it on a level surface, and measure dimension **A** with caliper.

Note 1: Two kinds of rings are used: one type for adjustment, and one type for locking.

Note 2: Before starting the measurement, fully fasten the locking ring to the adjusting ring.

Note 3: The 5" torch need not be adjusted.

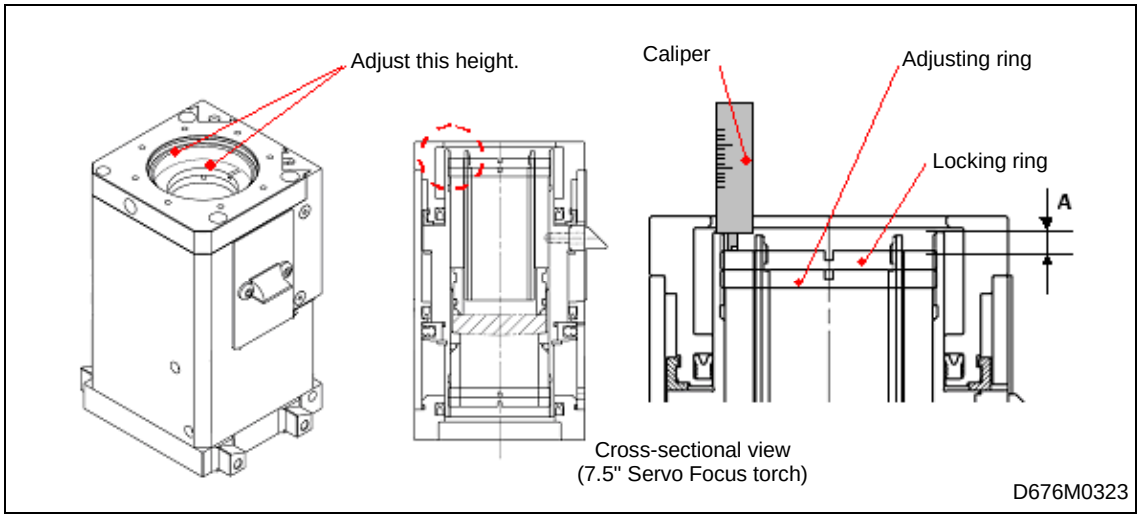


Fig. 9-8

Type of torch	A	
7.5"	5.0 ± 0.2 [mm]	0.20 ± 0.008 [in]
5" (option)	—	

* Lens end thickness: 0.38"

(3) Compare the measured dimension with the appropriate dimension listed in the above table, and if there is a difference, perform adjustments using the lens-fastening jig.

Note 1: Before conducting the adjustments, loosen the rings enclosed in a dotted-line frame (see below). These rings are located at the side opposite to the adjustment side.

Note 2: Dimension **A** differs according to the type of torch used.

Note 3: Dimension **A** also differs according to the type of lens used. The above listing is for the use of a lens having an end thickness of 0.38".

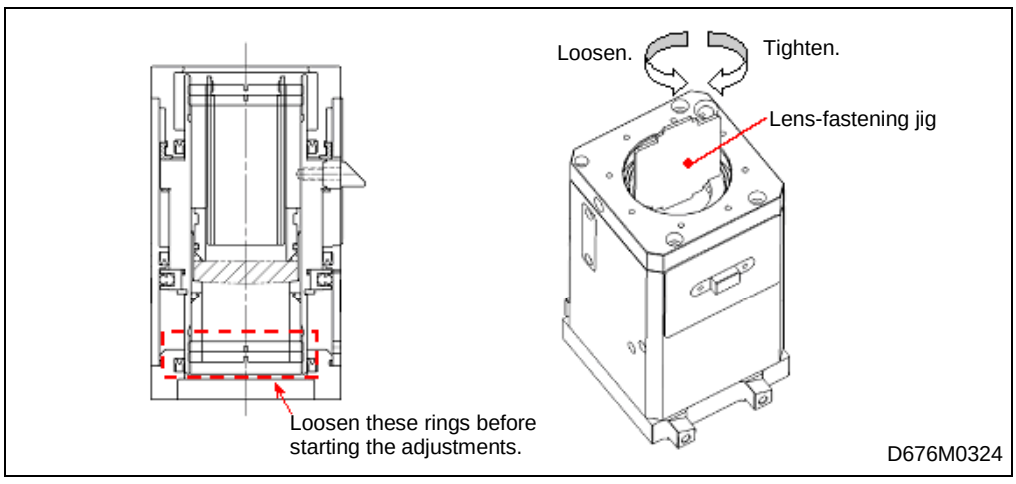


Fig. 9-9

(4) Measure dimension **B** with the torch top facing downward. Compare the measured value with the appropriate dimension listed in the table below, and perform any necessary adjustments. If dimension **B** also was already adjusted in above step (3), the adjustment at this side is not required.

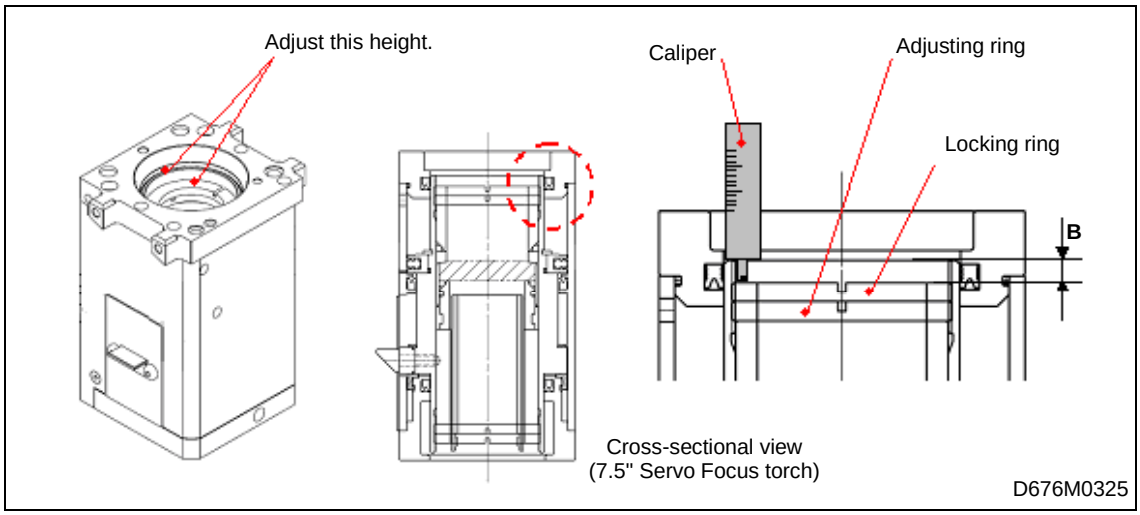


Fig. 9-10

Type of torch	B	
7.5"	5.8 ± 0.2 [mm]	0.23 ± 0.008 [in]
5" (option)	7.2 ± 0.2 [mm]	0.28 ± 0.008 [in]

* Lens end thickness: 0.38"

Note: If the corresponding section was also loosened in step (3), fully tighten the section before starting any adjustments (with a tightening torque of 3 N·m (2.2 ft·lbf) or less).

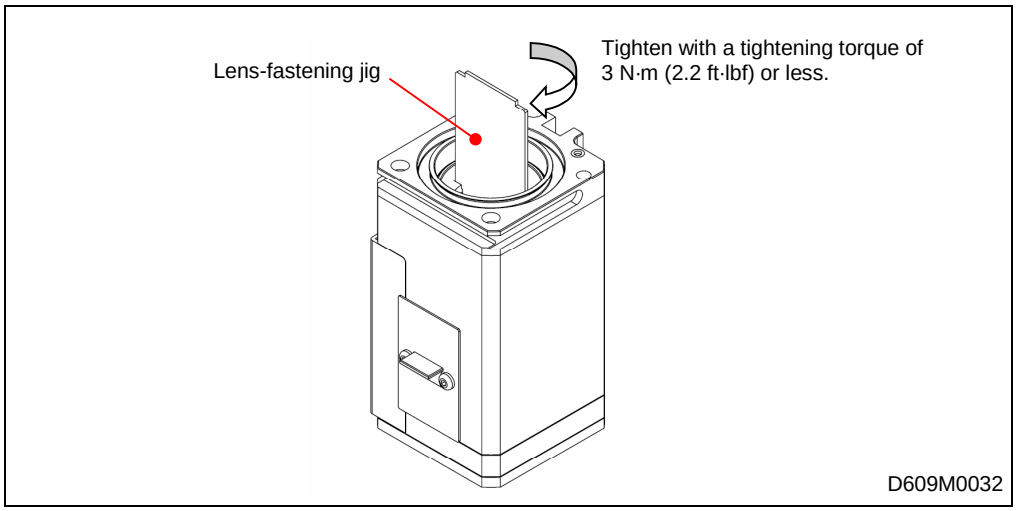


Fig. 9-11

(5) Mount the front end of the torch using a procedure reverse to that of step (1).

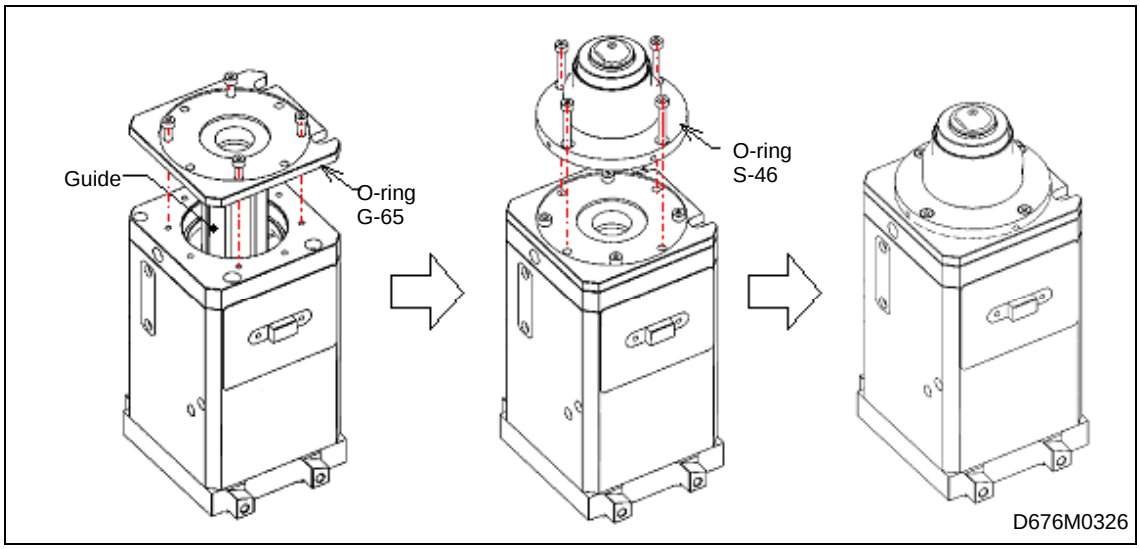


Fig. 9-12

Note 1: Be sure to mount the guide. Machining cannot be executed if the guide is not mounted.

Note 2: Two O-rings are used. Properly mount both O-rings with care so as not to damage the O-rings.

Note 3: When fastening the M4 screws, be sure to insert the wave washers. Without these washers, spattering during machining may prevent the screws from being loosened.

9-5-4 Procedure for mounting the torch

Mount the torch in accordance with the figure below.

(1) Return the Z-axis to its home position.

(2) Make sure that the TORCH DISMOUNT switch is valid (set to the **I** position).

(3) Mount the torch at the position shown in Fig. 9-13.

(4) Press the lever down to secure the torch.

(5) Connect the cable of the profiling unit (see Fig. 9-14).

(6) Make the TORCH DISMOUNT switch invalid (set to the **O** position).

Note: During automatic operation, leave the TORCH DISMOUNT switch invalid (set to the **O** position).

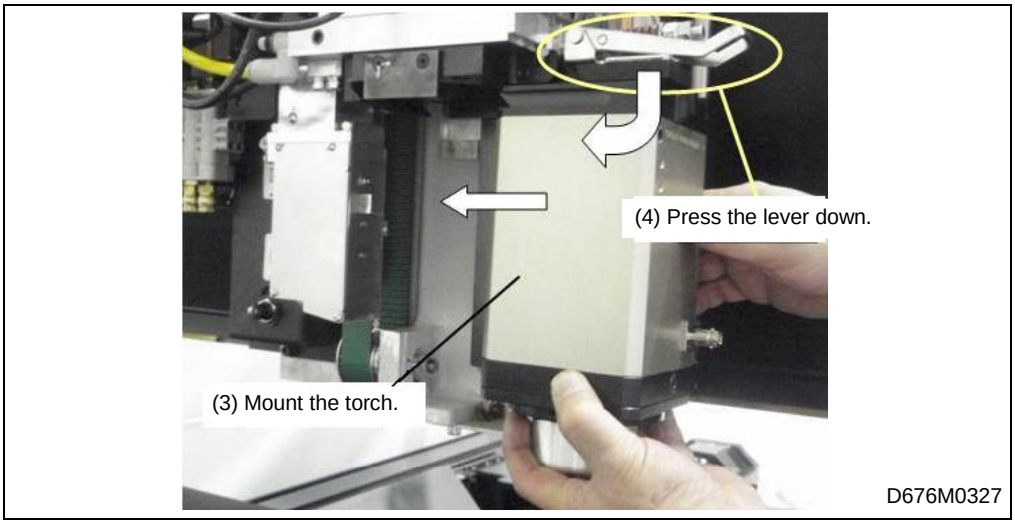


Fig. 9-13 Mounting the torch

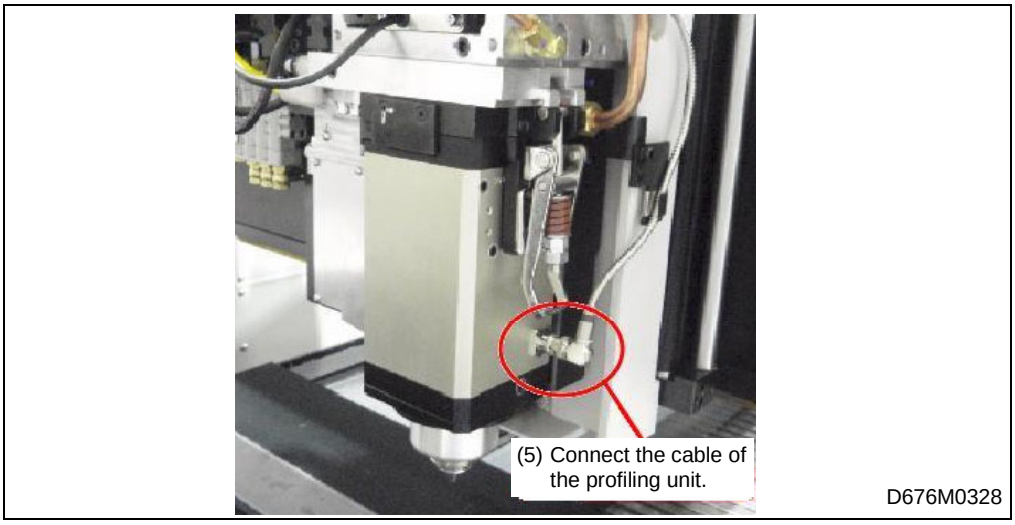


Fig. 9-14 Connecting the cable of the profiling unit

9-5-5 Procedure for removing the torch

Remove the torch in accordance with the figure below.

(1) Return the Z-axis to its home position.

(2) Make the TORCH DISMOUNT switch valid (set to the **I** position) while holding down the PERMISSION button on the NC operation panel.

Note: Press and hold the PERMISSION button until the W-axis home position indicator comes on. Otherwise, the torch cannot be removed (see figure below).

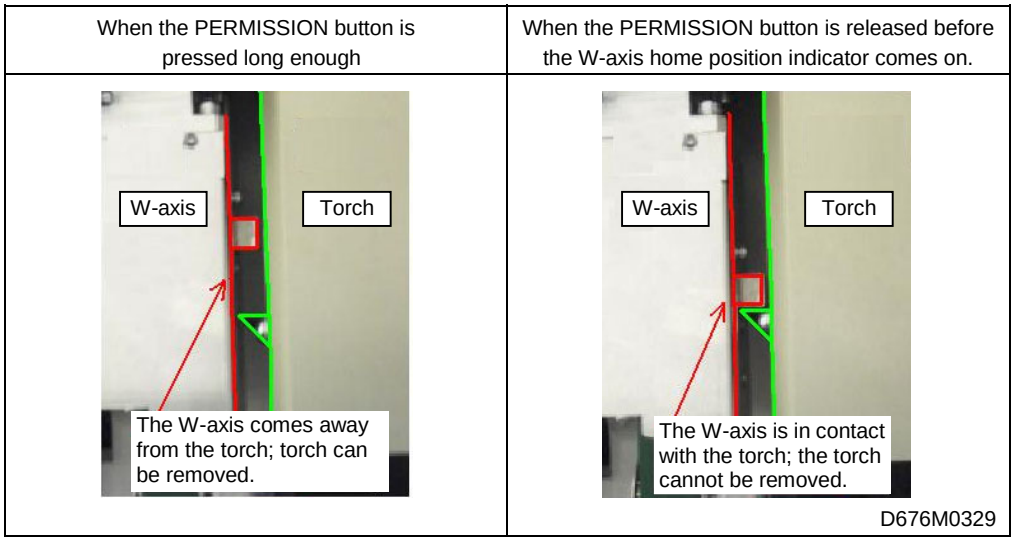

When the PERMISSION button is pressed long enough
When the PERMISSION button is released before the W-axis home position indicator comes on.
W-axis
Torch
The W-axis comes away from the torch; torch can be removed.
W-axis
Torch
The W-axis is in contact with the torch; the torch cannot be removed.
D676M0329

Fig. 9-15

(3) Disconnect the cable of the profiling unit.

(4) Move the lever upward.

(5) Hold the torch by hand and pull it in the direction of the arrow shown in Fig. 9-16.

Note 1: Before removing, be sure to hold the torch by hand securely not to drop and damage it.

Note 2: During automatic operation, leave the TORCH DISMOUNT switch invalid (set to the **O** position).

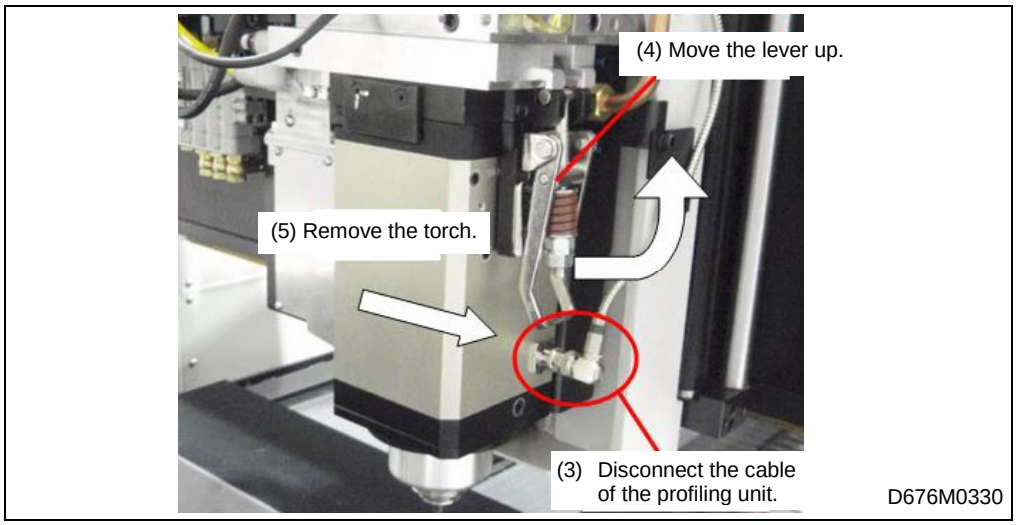


Fig. 9-16 Removing the torch

9-5-6 Confirming tool data

After manual replacement of the torch and the nozzle, there is a need to confirm the **TOOL DATA** screen.
For the confirmation procedure, refer to the Intelligent Loop System Operating Manual, “1-1-1 Checking tool data”.

9-6 Automatic Focusing Programs

This section explains the macro programs necessary to use the Servo Focus torch. Once the programs have been entered into the machine, their program numbers (PNos.) must not be modified. Modification could damage the torch and the machine.

To adjust focus in automatic operation mode, the program below needs to be created and executed. When this program is executed, the nozzle-focus distance (N.F) will be set to 0 mm. The focal point can be freely changed by entering the desired N.F value after U in the program.

Note 1: The program must be executed within the normal stroke of the X-axis.

ST-X48 MkIII: 0 to –2685
ST-X510 MkIII: 0 to –3235
ST-X612 MkIII: 0 to –4190

Note 2: Before executing the program, the focal point height must be detected. For the detecting procedure, refer to Chapter 2 of the Intelligent Loop System Operating Manual.

```
%
G22U0
%
```

Example: For N.F = –1, enter data as follows:

```
%
G22U–1.0
%
```

9-7 Manual Focus Adjustment

Automatic focal point height detection by a blue flame sensor is possible. Manual detection, however, is also possible. To perform manual focus adjustments, it is necessary to assign initial data to macrovariables.

Unless initial data entry is followed by lens cleaning or changing, the Servo Focus torch permits the nozzle-to-focus distance, or N.F, to be freely changed just by executing the program via the NC unit.

The laser radiation from the laser oscillator is focused on one point by the focusing lens. This point is referred to as the focus, which is the point of the highest laser radiation intensity. In other words, the point where the machine develops the highest processing performance can be located by adjusting the focus.

Note 1: On account of the laser beam projected, never fail to wear a long-sleeved shirt, gloves and safety goggles in adjusting the focus of the torch.

Note 2: The following procedure is explained on the premise that the laser operation switch is turned on and the laser operation is ready.

1. Procedure for the focus adjustment

(1) Initialize the position of the lens of the Servo Focus torch.

1) Return the Z-axis to its home position.

2) Use the handle or execute program operation to set the W-axis position to –25.0 in the machine coordinate system.

(2) Remove the nozzle from the nozzle body.

1) Remove the nozzle while pressing the nozzle-mounting/removing jig against the nozzle body.

Note: Make **TRACER** on the **SWITCH** screen invalid (set to **O**).

CAUTION

- Do not touch the nozzle with your body charged with static electricity when handling the nozzle. Neglect of this caution will result in the failure of the amplifier. Discharge the static electricity charged on the body by touching the machine base, etc. with your hand before handling the nozzle.

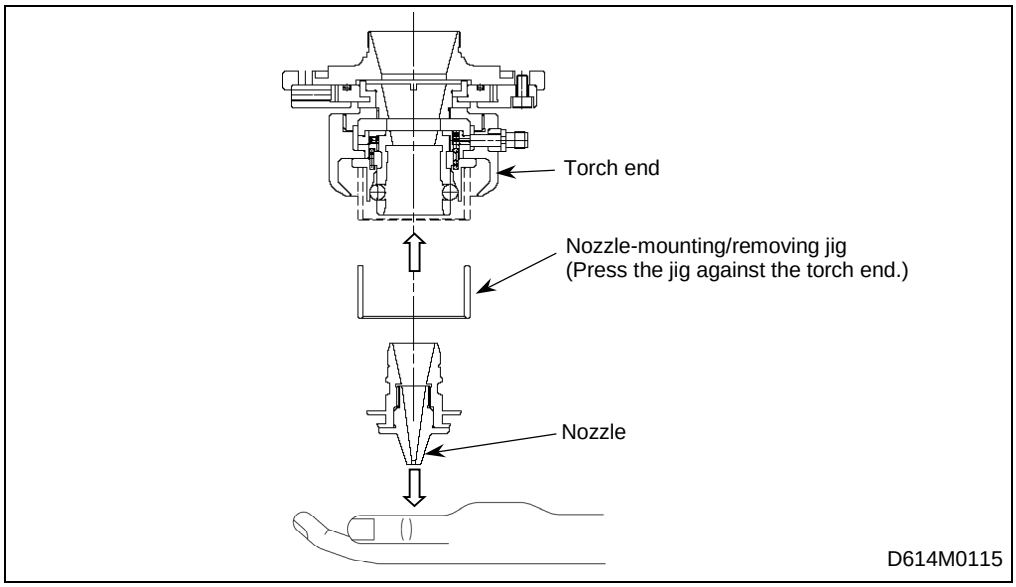
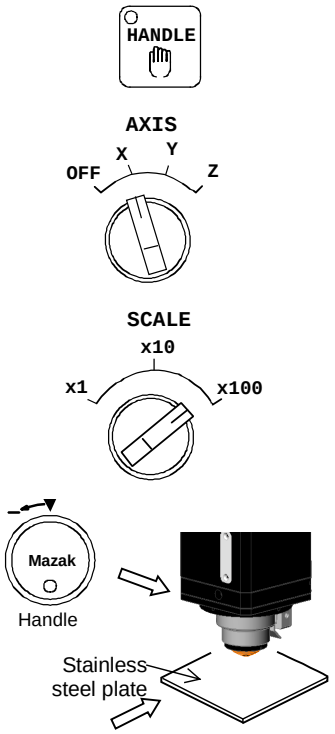
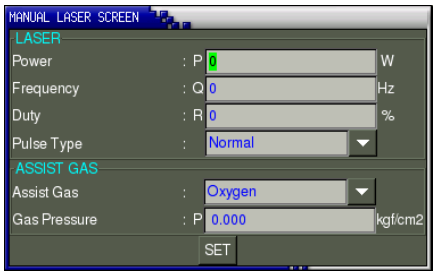
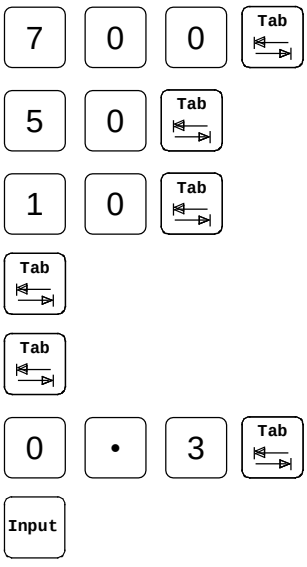
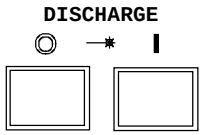
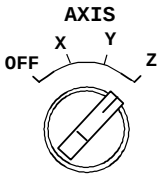
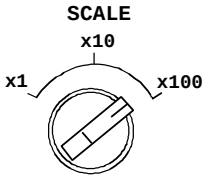


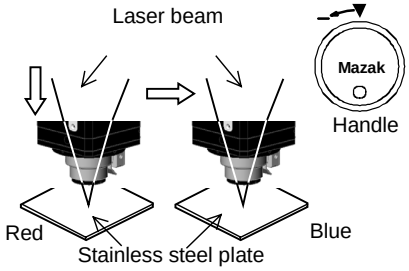
Fig. 9-17 Procedure for the focus adjustment

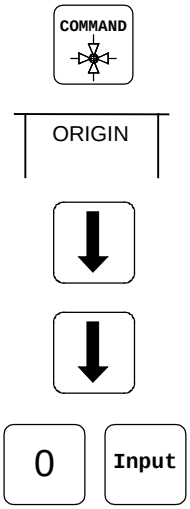
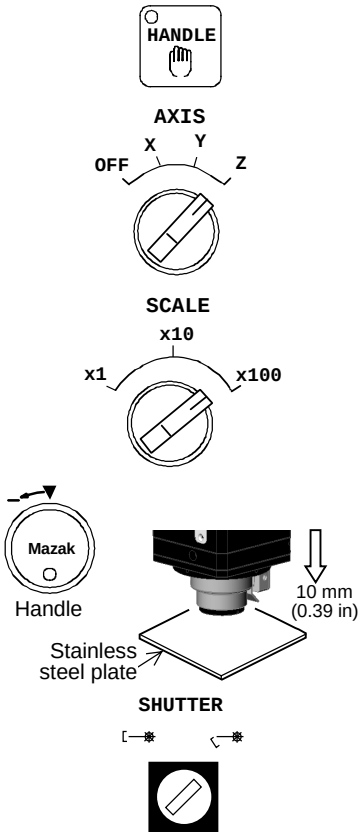
(3)		Move the torch above the stainless steel plate by the handle. 1) Press the HANDLE key of mode selection. 2) Turn the AXIS switch to “X”. 3) Turn the SCALE switch to “×100”. (This setting designates that the unit of feed by turning the handle by one position is 0.1 mm (0.01 in).) 4) Turn the handle in the “–” direction to move the work table. The motion along the Y-axis is also possible by the same operation.
(4)		Switch the display to **MANUAL LASER SCREEN**. 1) Press the LASER SET. key
(5)	 	Set the conditions of manual laser operation according to the messages. 1) Move the cursor to **P** of **MANUAL LASER SCREEN**. 2) Input 700 to **Power**. 3) Input 50 to **Frequency**. 4) Input 10 to **Duty**. 5) Set **Normal** for **Pulse Type**. (Always select **Normal** hereinafter.) 6) Set **Air** for **Assist Gas**. 7) Input 0.3 to **Gas Pressure**. 8) Verify that the cursor has moved to **SET**, and press the Input key.

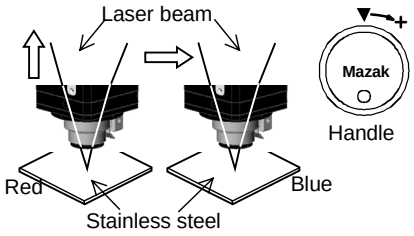
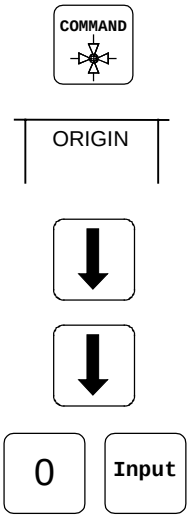
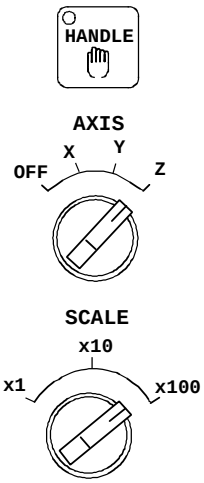
		9) Press the DISCHARGE **I** (ON) button.
(6)		Press the HANDLE key of mode selection for handle operation.
(7)	 	Designate the axis in motion and the feed. 1) Select “Z”. 2) Select “×100”. (This setting designates that the unit of feed by turning the handle by one position is 0.1 mm (0.01 in).)
(8)		Turn the laser SHUTTER key switch to the open side.

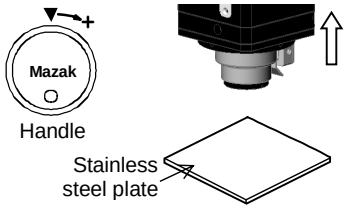
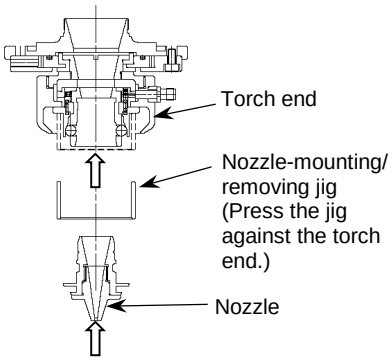
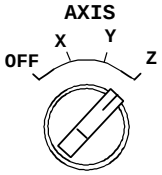
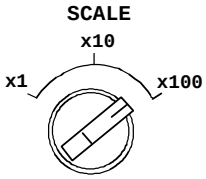
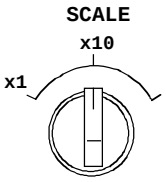
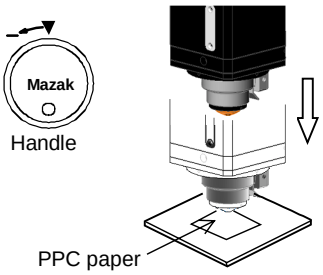
WARNING

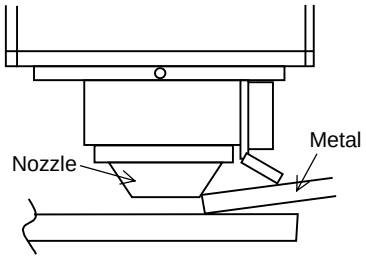
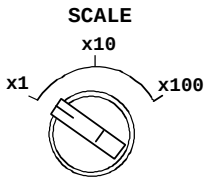
- Since the laser beam is projected when the laser SHUTTER key switch is turned to the open side, never put your hand or something under the torch.

(9)		Turn the handle in the “–” direction to move down the torch (Z-axis) with the laser SHUTTER key switch turned to the open side, and stop the torch at the position where the flame changes from red to blue. * This flame is called the “blue flame”.
(10)		Turn the laser SHUTTER key switch to the close side. **Note:** Close the shutter without fail.
(11)		Press the Reset key to stop the projection of the laser and the air.

(12)		Input 0 to the current position display of the Z-axis in the **ORIGIN SET** window. 1) Press the COMMAND key of screen selection. 2) Press the **[ORIGIN]** menu key. 3) Set the Z-axis to 0. Press the cursor key. Press the cursor key. Input 0 and press the Input key.
(13)		Select the handle mode and move the position of the X-axis or Y-axis slightly, following the same procedure as that described in the section (3).
(14)		Switch the display to **MANUAL LASER SCREEN**, and set the same conditions as those described in the section (5).
(15)		Move the Z-axis in the handle mode. 1) Press the HANDLE key of mode selection. 2) Select “Z”. 3) Select “×100”. 4) Turn the handle in the “–” direction to move down the torch (the Z-axis) by 10 mm (0.39 in). **Note:** The machine coordinate of the current Z-axis position should not exceed –111.000 (mm). 5) Turn the SHUTTER key switch to the open side.

(16)		Turn the handle in the "+" direction to move up the torch (the Z-axis) with the laser SHUTTER key switch turned to the open side, and stop the torch at the position where the flame changes from red to blue.
(17)		Turn the laser SHUTTER key switch to the close side.
(18)		Press the Reset key to stop the projection of the laser and the air.
(19)		Move up the torch to the position where the value of the current position display of the Z-axis in the screen is decreased to the half.
(20)		Input 0 to the current position display of the Z-axis in the **ORIGIN SET** window. 1) Press the COMMAND key of screen selection. 2) Press the **[ORIGIN]** menu key. 3) Input 0 to the Z-axis. Press the cursor key. Press the cursor key. Input 0 and press the Input key.
(21)		Move the torch away from the stainless steel plate by the handle. 1) Press the HANDLE key of mode selection. 2) Select "Z". 3) Select "×100".

		4) Turn the handle in the “+” direction to separate the torch from the worksheet in the appropriate distance (50 mm (1.97 in) and over).
(22)		1) Mount the nozzle on the nozzle body. Mount the nozzle while pressing the nozzle-mounting/removing jig against the nozzle body. 2) Make **TRACER** on the **SWITCH** screen valid (**I**).
(23)	    	Bring the nozzle tip into contact with the surface of the worksheet 1) Press the HANDLE key of mode selection. 2) Turn the AXIS switch to “Z”. 3) Turn the SCALE switch to “×100”. (This setting designates that the unit of feed by turning the handle by one division is 0.1 mm (0.01 in).) 4) Turn the handle to the “–” direction so as to move down the Z-axis (the torch), and to stop it at the position where the nozzle tip is at the height of about 1 to 2 mm (0.039 to 0.079 in) from the surface of a worksheet. 5) Turn the SCALE switch to “×10”. (This setting designates that the unit of feed by turning the handle by one division is 0.01 mm (0.001 in).) 6) Put a piece of paper such as PPC paper between the nozzle and the worksheet, and adjust the height so that the nozzle pushes down the paper to the extent that it would not be budged even if it is drawn.

	 	7) Turn the handle in the "+" direction by 2 to 3 divisions to pull out the paper. 8) Contact the nozzle with the worksheet using a metal tool, etc. 9) When **AUTO GAP CONTROL ALARM** is displayed on the screen, the function is normal. (When the alarm is not displayed, there is a possibility of broken cable.) 10) Press the Reset key to turn off the alarm. 11) Turn the SCALE switch to "×1". (This setting designates that the unit of feed by turning the handle by one division is 0.001 mm (0.0001 in).) 12) Lower the torch gradually division by division with the handle and stop it at the position where **AUTO GAP CONTROL ALARM** is displayed on the screen. (Define this condition as the contact standard between the nozzle and the worksheet.)
(24)		Confirm the lens mounting position. 1) Confirm the current position display of the Z-axis. 2) When the coordinate value is between –10.5 and –5.5 (for 5" torch) or –17.5 and –12.5 (for 7.5" torch), the following procedure can be eliminated. If the value is out of scope, execute the following steps to change the lens position. 3) **Example:** When the coordinate value of the Z-axis is –11.000: Move the lens downward by about 3 mm (0.12 in).
(25)		Input the Z-axis coordinate value obtained by measurement on the **TOOL DATA** screen as the focal length.

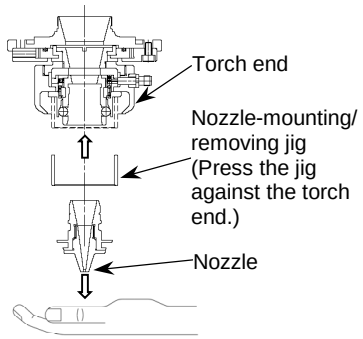
9-8 Center Adjustment

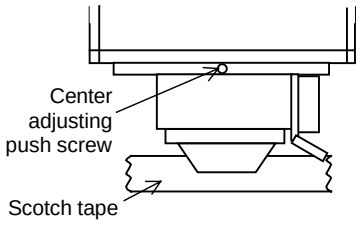
When the focusing lens is cleaned or changed or when the nozzle is changed, the center of the laser beam must be adjusted.
If the laser beam does not pass through the center of the nozzle, the machining accuracy may be lowered, or the parts of the non-contact nozzle may be damaged on account of the laser beam scattering.
The Servo Focus torch does not change the nozzle center, even if the focal distance is changed after the focus has been adjusted. Center adjustment, therefore, is not required.

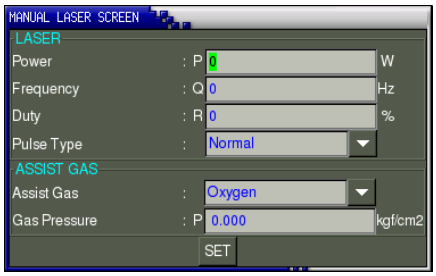
Note: Since the laser beam is projected during the center adjustment, never fail to wear a long-sleeved shirt, gloves and safety goggles.

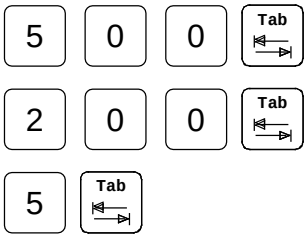
The following procedure is explained on the premise that the laser operation switch is turned on and the laser operation is ready.

Procedure for the center adjustment

<table>
<tr>
<td>(1)</td>
<td> 
</td>
<td>1) Make TRACER on the SWITCH screen invalid (O),

2) Remove the nozzle from the nozzle body.
Remove the nozzle while pressing the nozzle-mounting/removing jig against the nozzle body.</td>
</tr>
<tr>
<td>(2)</td>
<td> 




</td>
<td>Check the position of the center so as to prevent the part from being damaged by the laser beam.

1) Put scotch tape at the lower end of the torch. Care should be taken since the torch accumulates heat.

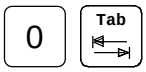
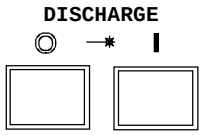
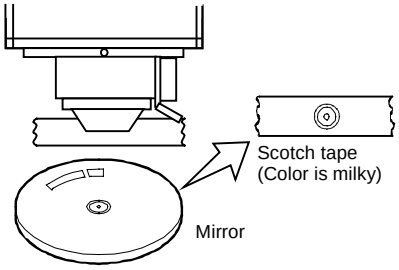
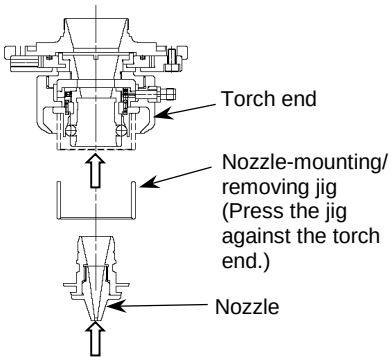
2) Set the conditions of manual laser operation according to the messages.

Move the cursor to P of MANUAL LASER SCREEN.

Input 500 to Power.

Input 200 to Frequency.

Input 5 to Duty.</td>
</tr>
</table>

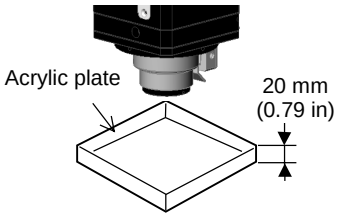
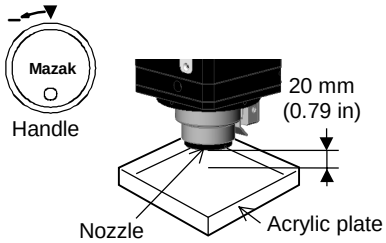
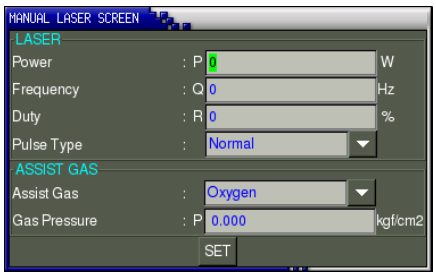
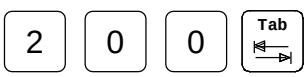
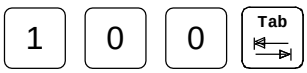
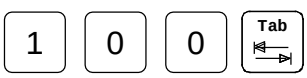
	      	Set **Normal** for **Pulse Type**. (Always select **Normal** hereinafter.) Set **Oxygen** for **Assist Gas**. Input 0 to **Gas Pressure**. Verify that the cursor has moved to **SET**, and press the Input key. Press the DISCHARGE **I** (ON) button. Press the HANDLE key of mode selection. Turn the laser SHUTTER key switch momentarily to the open side (for about 0.5 second). **Note:** Here the laser SHUTTER key switch is turned so as only to make a hole in the scotch tape. The switch shall be returned to the close side immediately. 3) Press the Reset key to stop the projection of the laser. 4) Confirm that the position of the laser beam, which is indicated with a black point, is at about the center of the torch, looking at it in a mirror. **Note:** If the black point is not at the center, follow the procedure stated below; 5) Adjust with the push screws for the center adjustment. (4 pieces) 6) Put new scotch tape. 7) Remove the mirror. 8) Follow again the procedure from 2).
(3)		1) Mount the nozzle on the nozzle body. Mount the nozzle while pressing the nozzle-mounting/removing jig against the nozzle body. **Note:** Be careful of the direction of the copper ring. Fix the nozzle firmly so that it does not become loose. 2) Make **TRACER** on the **SWITCH** screen valid (**I**).

Note: Be sure to press the LASER HIGH VOLTAGE **I** (ON) button before the projection of the laser beam, and to press the LASER HIGH VOLTAGE **O** (OFF) button after the projection.

The adjustment of the torch focus is completed by the procedure above. Now the adjustment of the laser beam center will be treated as the next step.

(4)	Program contents % G22U0 ← 0 %	Set the nozzle-focus distance (N.F) to 0 mm. **Note:** Follow the procedure described in Section 9-6. 1) Select **[FILE]** on the **COMMAND** screen. 2) Select the created program from the opened window and click **[CONFIRM]**. 3) Make sure that the contents of the program are as shown at left. 4) If necessary, edit the program to change the value after "U" to 0. 5) Press the AUTO key of mode selection. 6) Press the CYCLE START button. **Note:** Confirm that TORCH DISMOUNT switch is placed to **O** (invalid) position.

Note: Make **TRACER** on the **SWITCH** screen valid (**I**).

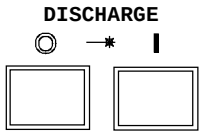
(5)		Rough adjustment 1) Prepare an acrylic plate. (Thickness: about 20 mm (0.79 in))
		2) Turn the handle in the "–" direction to move down the Z-axis so that the distance between the nozzle tip and the acrylic plate will be about 20 mm (0.79 in).
		3) Press the LASER SET. key.
		4) Set the conditions of manual laser operation according to the messages. Move the cursor to **P** of **MANUAL LASER SCREEN**.
		Input 200 to **Power**.
		Input 100 to **Frequency**.
		Input 100 to **Duty**.

Set **Normal** for **Pulse Type**.
(Always select **Normal** hereinafter.)

Set **Air** for **Assist Gas**.

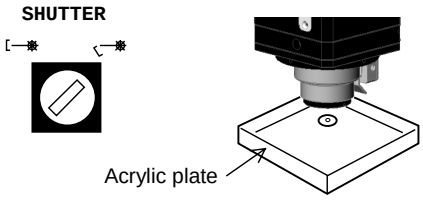
Input 0.3 to **Gas Pressure**.

Verify that the cursor has moved to **SET**, and press the Input key.



Press the DISCHARGE **I** (ON) button.

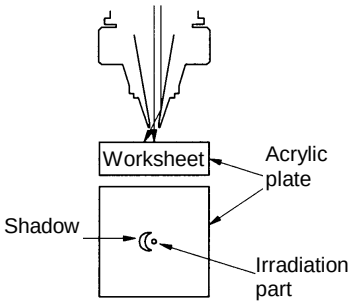
5) Press the HANDLE key of mode selection.



6) Turn the laser SHUTTER key switch to the open side, and perform machining of the acrylic plate (for about 2 to 4 seconds).

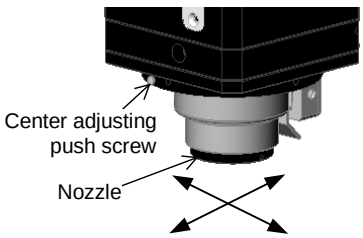
7) Turn the laser SHUTTER key switch to the close side.

8) Press the Reset key to stop the projection of the laser and the air.



9) Take out the acrylic plate and observe the irradiation part on it.
If the laser beam hits on inside the torch, a shadow is generated by the scattered beam in the opposite direction to the hit.

Note: If a shadow is found on the plate, follow the procedure stated below;



10) Adjust with the center adjusting push screws. (4 pieces)

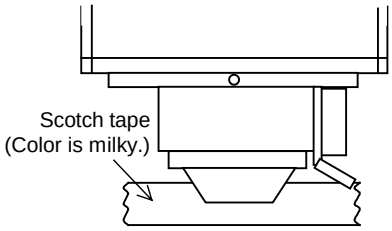
11) Put an acrylic plate under the torch.

12) Follow again the procedure from 2).

WARNING

- Since the laser beam is projected when the laser SHUTTER key switch is turned to the open side, never put a hand or something under the torch.

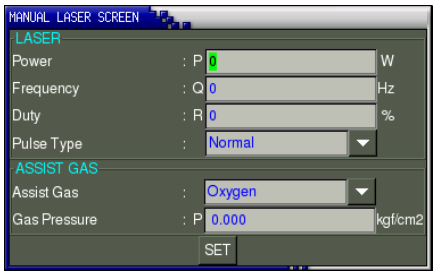
(6)



Fine adjustment

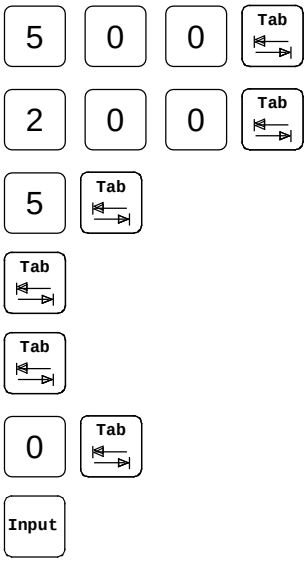
1) Put scotch tape (milky color) at the tip of the nozzle.

Note: Care should be taken since the torch accumulates heat.



2) Set the conditions of manual laser operation according to the messages.

Move the cursor to **P** of **MANUAL LASER SCREEN**.



Input 500 to **Power**.

Input 200 to **Frequency**.

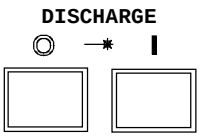
Input 5 to **Duty**.

Set **Normal** for **Pulse Type**.
(Always select **Normal** hereinafter.)

Set **Oxygen** for **Assist Gas**.

Input 0 to **Gas Pressure**.

Verify that the cursor has moved to **SET**, and press the Input key.



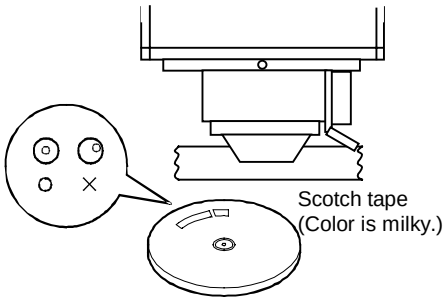
Press the DISCHARGE **I** (ON) button.

3) Press the HANDLE key of mode selection for handle operation.

4) Turn the laser SHUTTER key switch momentarily to the open side (for about 0.5 second).

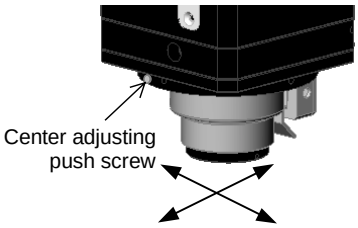
Note: Here the laser SHUTTER key switch is turned so as only to make a hole in the scotch tape. The switch shall be returned to the close side immediately.

5) Press the Reset key to stop the projection of the laser and the oxygen.



6) Confirm that the position of the laser beam, which is indicated with a black point, is at about the center of the torch, looking at it in a mirror.

Note: If the black point is not at the center, follow the procedure stated below.



7) Adjust with the center adjusting push screws. (4 pcs.)

8) Put new scotch tape.

Note: Care should be taken since the torch accumulates heat.

9) Follow again the procedure from 2).

Note: Be sure to press the LASER HIGH VOLTAGE **I** (ON) button before the projection of the laser beam, and to press the LASER HIGH VOLTAGE **O** (OFF) button after the projection.

9-9 Focus Change

When manual focus adjustment described in Section 9-7 and center adjustment described in Section 9-8 are completed, the focus can be changed using the NC unit.
Change the focal distance (N.F) according to the type-of-material and thickness of the workpiece.
The focus change program can be executed in automatic operation mode.

Programming format: G22U____ ;
N.F adjustable range: –7.0 mm (– 0.28 in) ≤ N.F ≤ +5.0 mm (+0.20 in) (5" torch)
–19.0 mm (– 0.75 in) ≤ N.F ≤ +5.0 mm (+0.20 in) (7.5" torch)

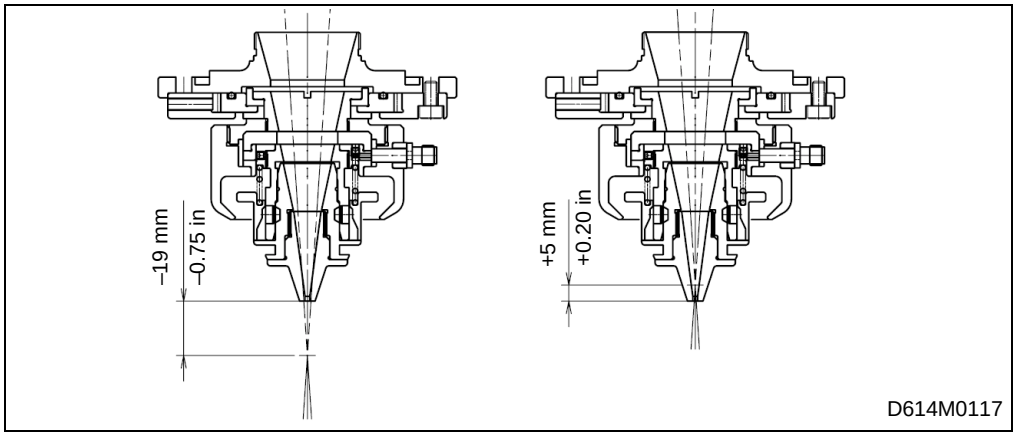


Fig. 9-18 N.F adjustable range

Note: Before changing the focus, check that the TORCH DISMOUNT is set to **O** (invalid).

Proceed as follows to change N.F to –1.5 mm, for example:

(1)	Program contents % G22U0 ← –1.5 %	Set the nozzle-focus distance (N.F) to 0 mm. **Note:** Follow the directions in Section 9-6. 1) Select **[FILE]** on the **COMMAND** screen. 2) Select the created program from the opened window and click **[CONFIRM]**. 3) Make sure that the contents of the program are as shown at left. 4) Edit the program so that the value following "U" is –1.5. 5) Press the AUTO key of mode selection. 6) Press the CYCLE START button. **Note:** Confirm that TORCH DISMOUNT switch is placed to **O** (invalid) position.

Note 1: When the following operation has been executed, repeat the following adjustment.

[1] After lens changing, restart the procedure from manual focus adjustment (Section 9-7) and center adjustment (Section 9-8).

[2] After lens cleaning, restart the procedure from center adjustment (Section 9-8).

Note 2: Entry/execution of data out of the required focus-changing range (–19.0 mm to +5.0 mm) results in an alarm and deactivates the machine.

9-10 Precheck Items

After power-on or during extended suspension of machining, the need may arise to execute the focus change function of the Servo Focus torch once again. The items to be checked prior to machining to ensure normal use of the Servo Focus torch, working safety, and machining with appropriate parameters, are listed below.

Note: The explanation given below assumes that the main power switch (operating handle for the main power breaker of the control panel) and the NC power switch (power ON button on the operating panel) are both turned on.

- Check that the torch unit is free from backlash.
  If a backlash is found, tighten the nut on the brown spring at the torch mounting section.
- Check that the focal distance is appropriate.
  To machine worksheets with the desired N.F (example: N.F = –1.0 mm) after extended periods of machine shutdown, execute “G22U–1.0;” once again in automatic operation mode to change the focus. Since the focus change function of the Servo Focus torch can be performed within one minute, checking the focal distance is recommended.
- Check non-contact profiling unit status.

9-11 Precautions

1. Before using the Servo Focus torch, set **TRACER** on the **SWITCH** screen to **I** (valid). If this switch is set to **O** (invalid), automatic operation cannot be executed.
2. Before using the Servo Focus torch, set the TORCH DISMOUNT switch to **O** (invalid). If this switch is set to **I** (valid), automatic operation cannot be executed.
3. Be sure to mount the nozzle to use an assist gas for the Servo Focus torch. If the nozzle is not mounted, the resulting movement of the lens may change N.F.
4. To use an assist gas for the Servo Focus torch, supply the gas at a pressure not exceeding 2.0 MPa. If this value is exceeded, the resulting movement of the lens may change N.F.

9-12 Trouble Shooting

Trouble with the torch or problems associated with its handling may occur. More specifically, the Servo Focus torch may not operate properly or machining defects may occur.

Understand the following troubleshooting measures and correct the trouble properly:

Condition	Cause	Measure	Reference
Autonomous movement of the lens during machining results in machining defects.	The assist gas pressure is in excess of 2.0 MPa.	Supply the gas at a pressure not exceeding 2.0 MPa.	9-2
	The diameter of the nozzle being used is out of specifications (1.2 to 4.0 mm diameter).	Use a nozzle of the MAZAK-specified diameter.	Operating Manual 3-4
	The quick exhaust valve is damaged.	Replace the valve. Contact Mazak Technical Center or Technology Center.	—
	The flow regulator (exhaust valve) is clogged.	Replace the regulator. Contact Mazak Technical Center or Technology Center.	—
Although the lens does not move during machining, machining defects occur.	The lens-fastening force is too weak to immobilize the lens.	Fasten up the lens.	9-5-1
	Data that has been assigned to the focal length during manual focus adjustment described in Section 9-7 is not correct.	Enter the correct data during readjustment.	9-7
	The guide is missing in the torch.	Mount the guide.	9-3
	The laser radiation is interfering because of the insufficiency in nozzle diameter.	Use the appropriate nozzle for the particular focal distance (N.F).	9-2
The sound of assist gas leakage from the torch is heard.	One or more of the four O-rings at the top of the torch have come off or slid out of position.	Replace the O-ring(s).	9-5-2
	The 4DP-48 O-ring at the top of the lens holder is out of position.	Return the O-ring to the correct position.	9-5-3
A press of the CYCLE START button does not start the program.	The TORCH DISMOUNT switch is set to **I** (valid).	Set the TORCH DISMOUNT switch to **O** (invalid).	9-5-3
	The open/close cover is open.	Close the cover.	—
	Appropriate data (–19.0 to +5.0) is not assigned to “G22U?;”.	Assign appropriate data.	9-9
	Appropriate data are not assigned to the focal length.	Assign appropriate data.	9-7
The torch unit cannot be removed from the machine.	The PERMISSION button is released before the W-axis home position indicator comes on.	When the TORCH DISMOUNT switch is made valid (set to the **I** position), press and hold the PERMISSION button until the W-axis home position indicator comes on.	9-5-4
Removal of the torch generates the sound of air leakage from the torch bracket.	The TORCH DISMOUNT switch is set to **O** (invalid).	Set the TORCH DISMOUNT switch to **I** (valid).	9-5-4
At the time of torch removal, the lens does not descend.	The resistance on the sliding surface is too great.	Apply grease to the sliding surface.	9-13-2
The torch pin does not follow the W-axis arm.	The resistance on the sliding surface is too great.	Apply grease to the sliding surface.	9-13-2

9-13 Maintenance

9-13-1 Daily inspection

Perform the following inspection to ensure safe usage of the Servo Focus torch:

No.	Inspection item	Contents	Remarks
1	Running in the torch	Move the rod of the torch.	Either programmed running-in or manual running-in is possible.

1. Programmed running-in

When the Servo Focus torch is mounted in the machine, execute this program:

```
%
O0001
M98P100L10
M30

O100
G90G01W-27.5.F3000
G04X0.5
G01W-3.5
G04X0.5
M99
%
```

2. Manual running-in

Run in the Servo Focus torch manually if it is not mounted in the machine.

<Procedure>

(1) Push the arm by hand and move the rod through 10 reciprocating actions vertically.

Note 1: The stroke of the arm is 27 mm (1.06 in).

Note 2: During manual running-in, do not block the O-ring by hand. Otherwise, running-in will be impossible because of the arm remaining inactive.

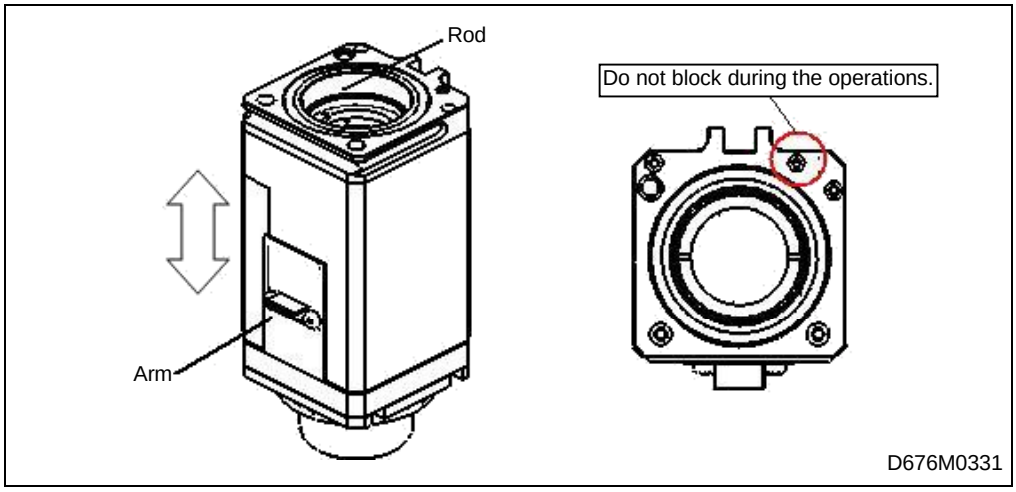


Fig. 9-19

(2) Rotate the arm so that the cover does not interfere with the body.

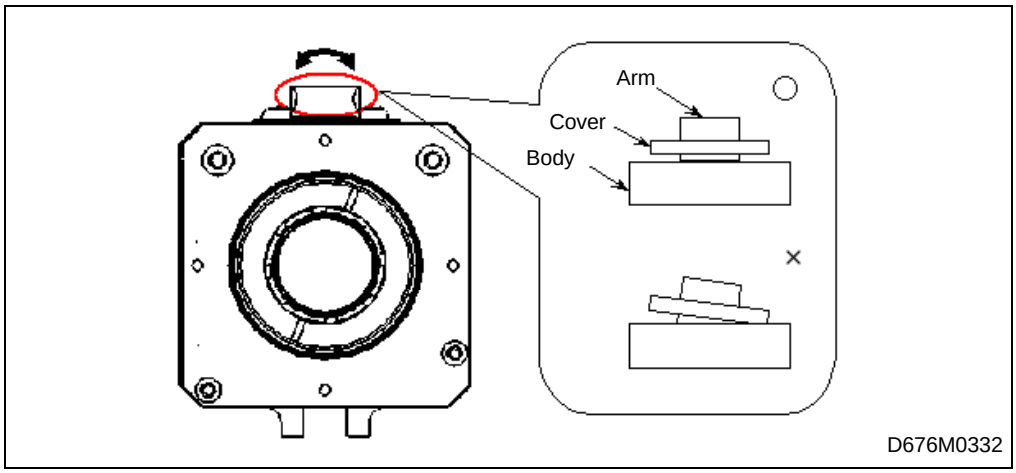


Fig. 9-20

9-13-2 Periodic maintenance and inspection

1. Inspection item

Perform the following periodic inspection to ensure safe usage of the laser machine:

No.	Inspection item	Equipment	Contents	Work	Charge	Remarks
1	Servo Focus torch	Torch	Greasing	Cleaning, greasing, operation check	Customer	Every 6 months

2. Greasing the Servo Focus torch

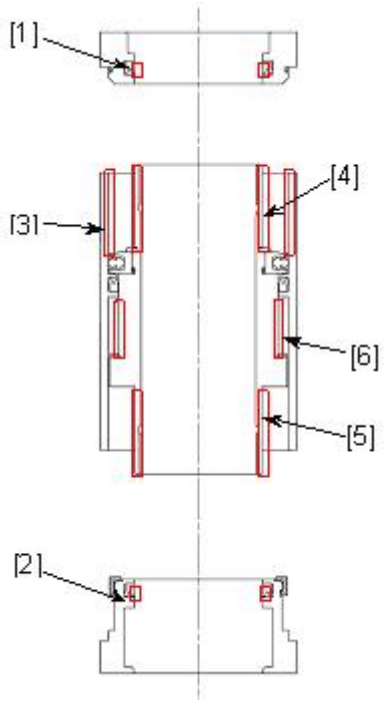
A. Tools and materials required:

- Measuring spoon
- Teflon grease (DUPONT KRYTOX GREASES GPL225)
- Waste cloth

Note: Use the MAZAK-specified Teflon grease.

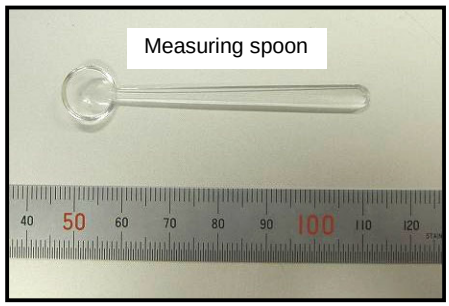
B. Greasing method

Apply the specified amount of Teflon grease equally to sections [1] to [6] shown below.



No.	Measuring spoonfuls required	Quantity	
		cm^3	in^3
[1]	1	0.1	0.006
[2]	1	0.1	0.006
[3]	1.5	0.15	0.009
[4]	1	0.1	0.006
[5]	1	0.1	0.006
[6]	1	0.1	0.006

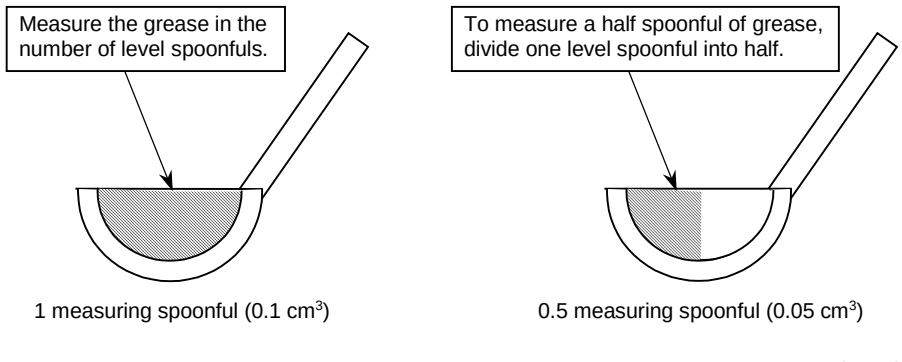
Calculate the amount of grease in measuring spoonfuls (0.1 cm^3/0.006 in^3).



D676M0333

Fig. 9-21 Sections to be greased

Measure the amount of grease as directed below.


Measure the grease in the number of level spoonfuls.
To measure a half spoonful of grease, divide one level spoonful into half.
1 measuring spoonful (0.1 cm³)
0.5 measuring spoonful (0.05 cm³)

D614M0123

Fig. 9-22 Measuring the Teflon grease

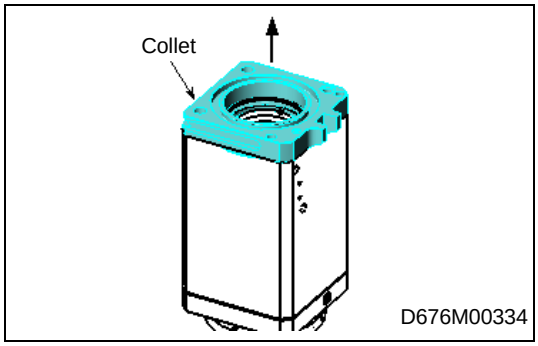
Note 1: Strictly observe the specified amount of greasing. Overgreasing will foul the lens.

Note 2: Before applying the Teflon grease, wipe away dirty grease with a waste cloth.

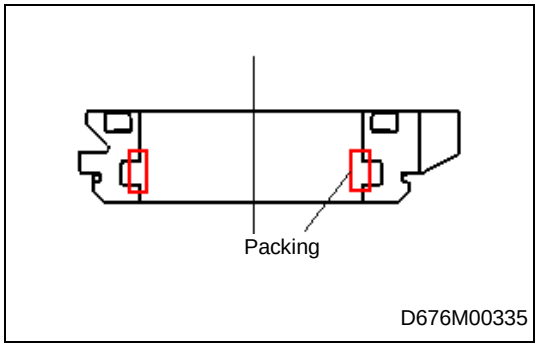
Note 3: Remove the lens before greasing. Otherwise, machining defects may result from possible fouling of the lens. See Subsection 9-5-2, Replacing the lens, for details of lens removal.

C. Procedure

(1) Remove the collet.

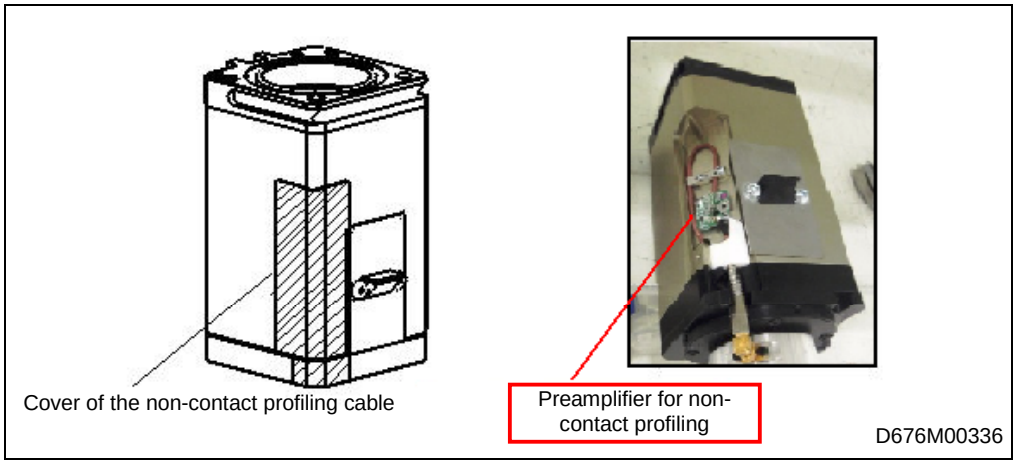


(2) Apply the Teflon grease to the inner surface of the packing inside the collet. The amount of greasing required is one measuring spoonful (0.1 cm^3).

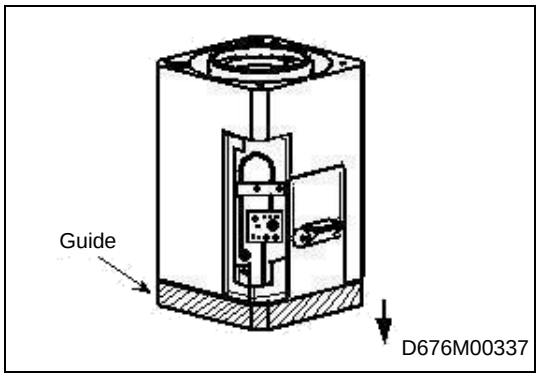


(3) Remove the cover of the non-contact profiling cable.

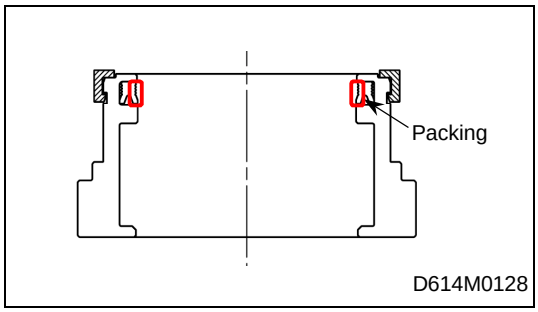
Note: After removal of the cover, the preamplifier for non-contact profiling will be exposed. Be careful not to damage the preamplifier.



(4) Remove the guide.

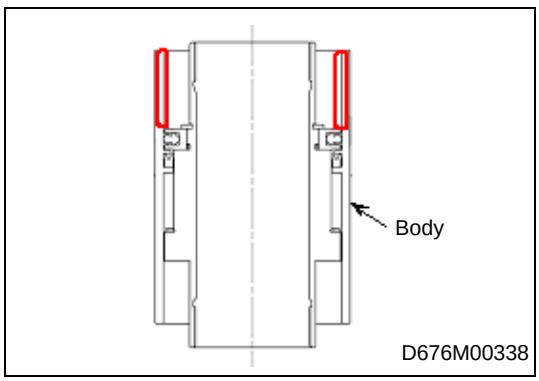


(5) Apply the Teflon grease to the inner surface of the packing inside the guide. The amount of greasing required is one measuring spoonful (0.1 cm^3).

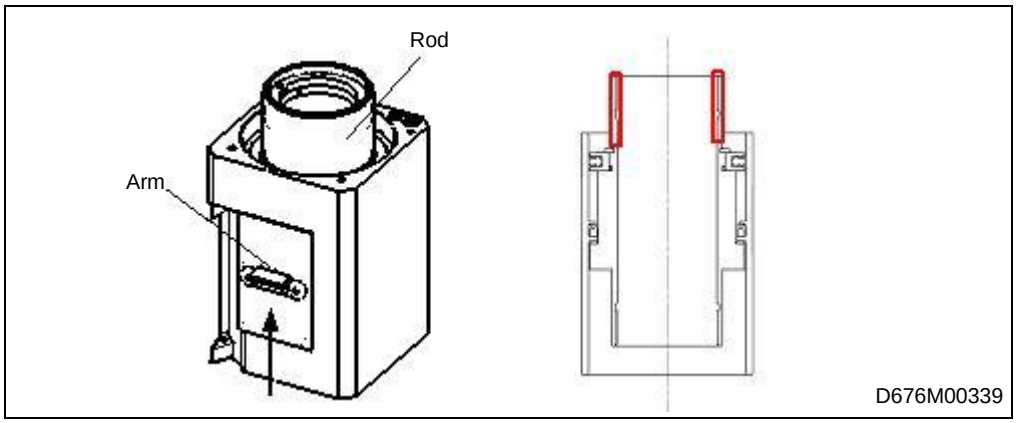


(6) Apply the Teflon grease to the inside of the body. The amount of greasing required is 1.5 measuring spoonfuls (0.15 cm^3).

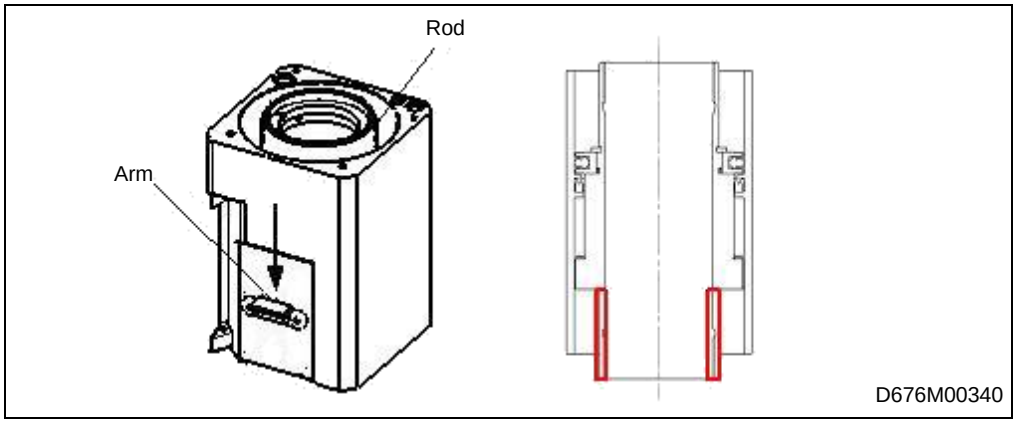
Note: Apply the Teflon grease only to the specified sections.



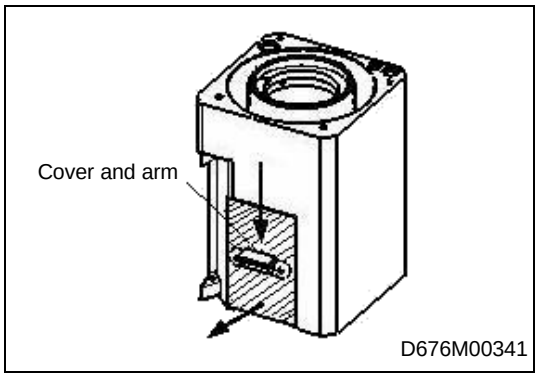
(7) Push the arm to raise the rod to the end of its upper moving stroke. After this, apply the Teflon grease to the top of the rod. The amount of greasing required is one measuring spoonful (0.1 cm^3).



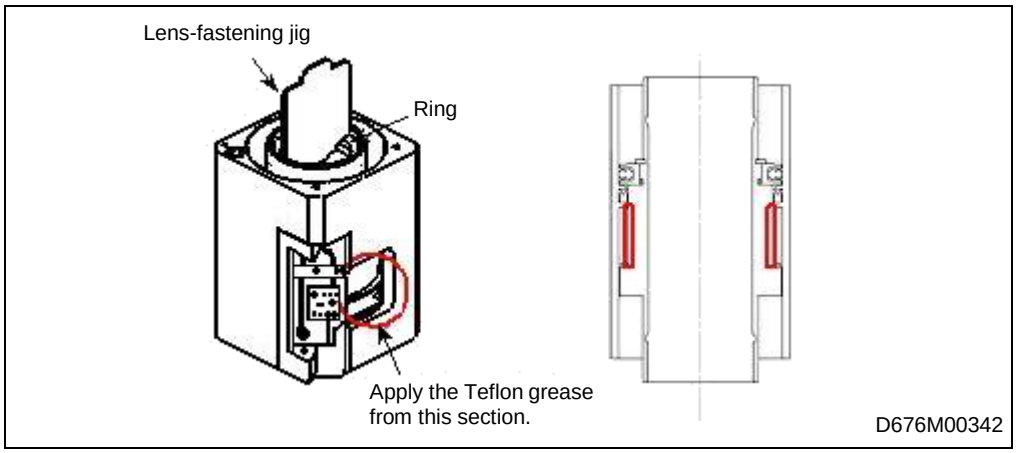
(8) Push the arm to lower the rod to the end of its lower moving stroke. After this, apply the Teflon grease to the bottom of the rod. The amount of greasing required is one measuring spoonful (0.1 cm^3).



(9) Remove the cover and the arm.

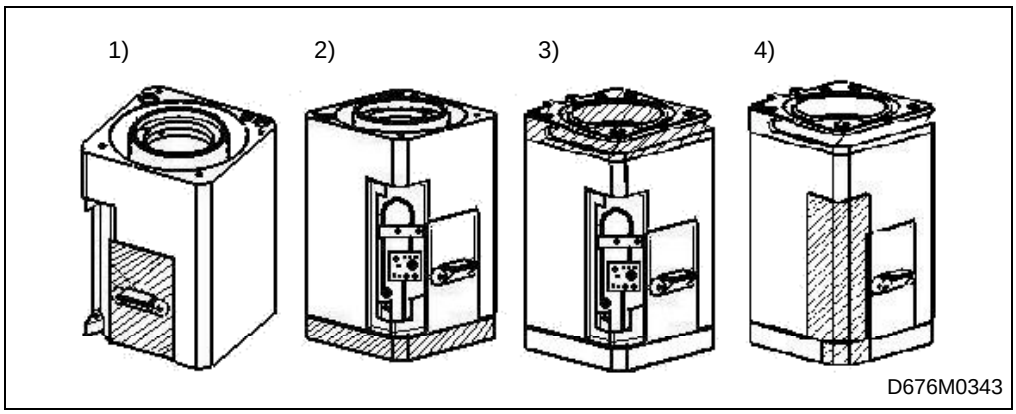


(10) Apply the Teflon grease to the inside of the rod. The amount of greasing required is one measuring spoonful (0.1 cm^3).
Before applying the Teflon grease, rotate the ring by means of the lens-fastening jig to rotate the rod, and apply the grease from where the cover has been removed.

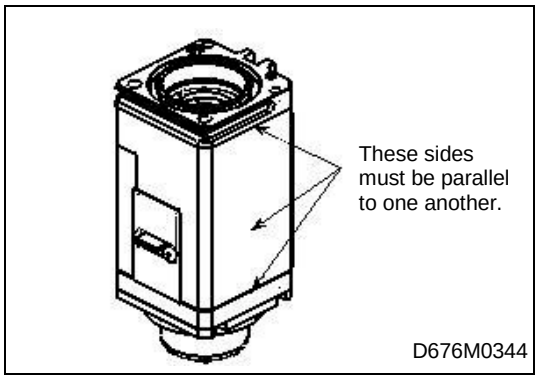


(11) Assemble the Servo Focus torch using the following procedure:

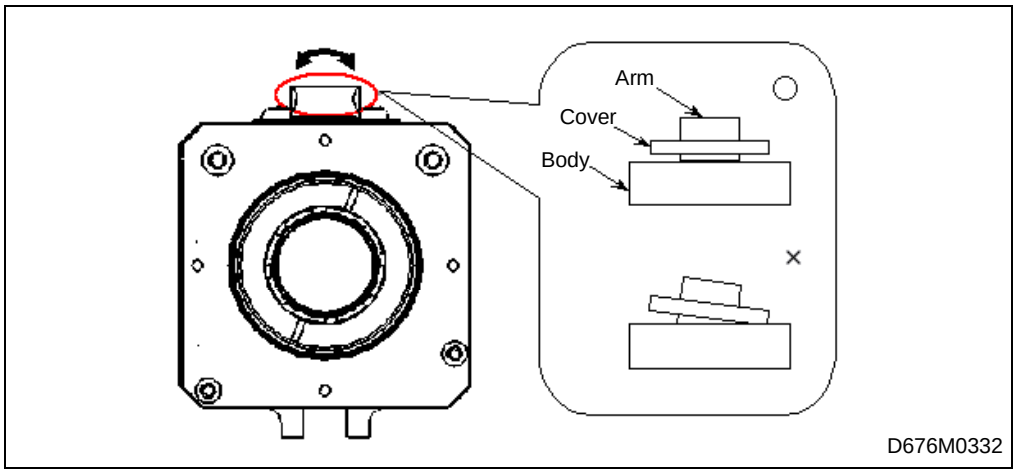
1) Mount the cover and the arm.
2) Mount the guide (see Note 1 below).
3) Mount the collet (see Notes 1, 2 below).
4) Mount the cover of the non-contact profiling cable.



Note 1: Mount the guide and the collet so that the sides of both are parallel with respect to the side of the body.

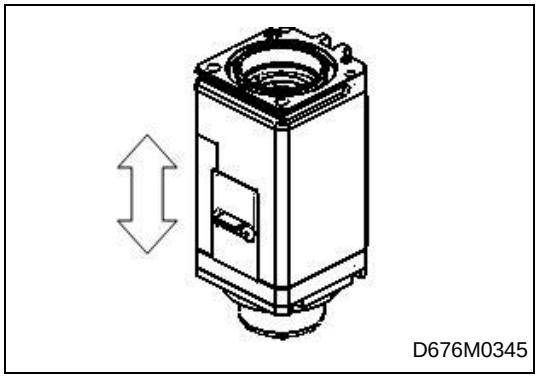


Note 2: After the assembly, adjust the arm so that the cover does not interfere with the body.



(12) Perform operational checks as directed below.

1) Run in the Servo Focus torch.
   See Subsection 9-13-1, Daily inspection, for the procedure.
2) Check for normal non-contact profiling by M32.



- NOTE -

10 CLEANING AND REPLACEMENT OF CONVERGENT LENS

The convergent lens used for laser processing becomes soiled as it is used and its performance is lowered accordingly. To recover its performance, the lens must be cleaned at regular intervals. This section deals with the procedure to be followed for cleaning and replacing the convergent lens.

DANGER

- Mirrors attached to the laser beam circuit should only be removed by Mazak service engineers.

WARNING

- The convergent lens uses zinc selenide (ZnSe) as its material. The ZnSe material is poisonous. This material not only has a potential hazard leading to the occurrence of persons' and animals' life-threatening accidents if the material is mishandled, but also pollutes the environment significantly. The convergent lens is precoated and has no poisonousness under its normal status. Damaged convergent lens, however, becomes poisonous, and smoke due to thermal damage is poisonous.
- When cleaning the lens, do not mix acetic acid and acetone. Mixing could result in explosion.

The materials used in the manufacture of optical parts with lasers are totally different from the materials used in lenses and mirrors for cameras and eyeglasses. Special precautions are also necessary, due to the fact that these parts are subject to very high energy levels of several kilowatts. The convergent lens should be handled with extreme care, in accordance with the precautions outlined below.

10-1 Never Do the Following

When handing a convergent lens, strictly observe the following points. These are very important to maintain the performance of the convergent lens.

- Never touch the lens surface of the convergent lens, and never allow it to rub against other objects.
  The vapor deposition surfaces of the lens are very soft and extremely susceptible to scratches. If any grease from the hands or any foreign matter sticks on them, it can cause serious damage to the lens, which lowers performance.

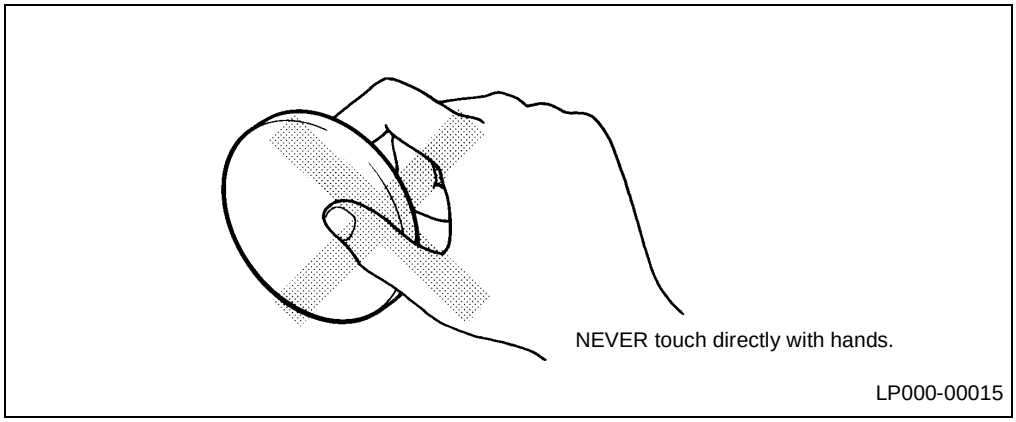


Fig. 10-1 Things not to do when handling lenses (1/6)

- Never wash the lens vigorously with water, soap or alcohol.
  The vapor deposition surfaces of the lens are very soft, and vigorous use of water, soap or alcohol on these surfaces can cause scratches or other damage, which lower performance.

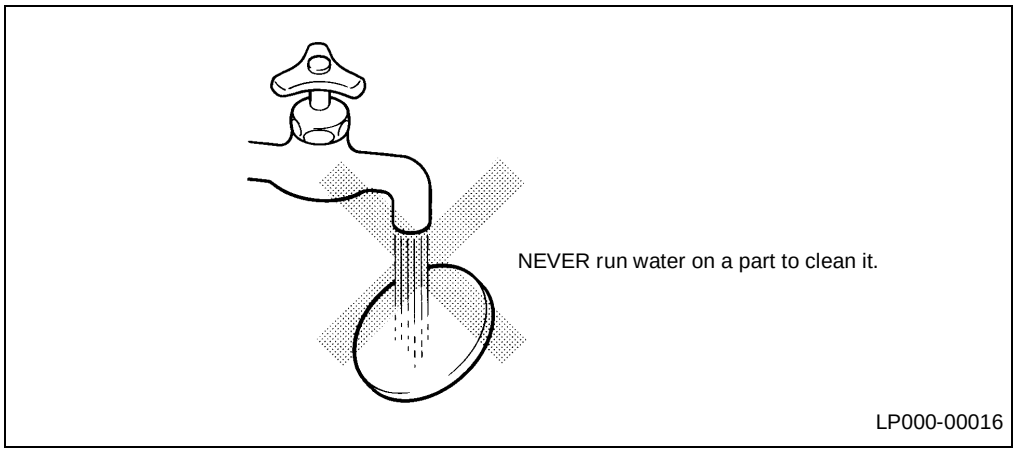


Fig. 10-2 Things not to do when handling lenses (2/6)

- Never store the lens in locations subject to high humidity or a high level of dust in the air.
  The vapor deposition surfaces of the lens are extremely sensitive to humidity, and if left for a long period of time in a location where the humidity is high, they will peel, lowering performance.

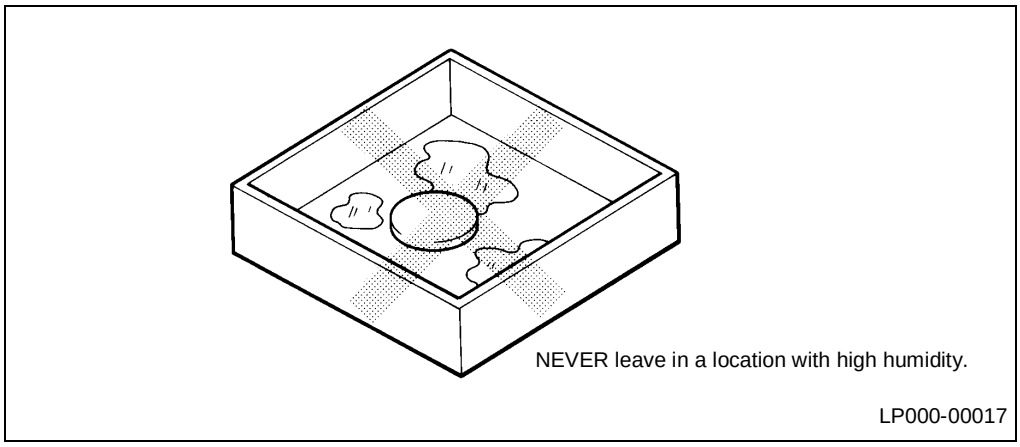


Fig. 10-3 Things not to do when handling lenses (3/6)

- Never emit a laser beam onto a lens to which dust, water droplets or any other type of foreign matter is adhering.
  Dust, dirt, etc. will absorb laser beams and can damage the lens.

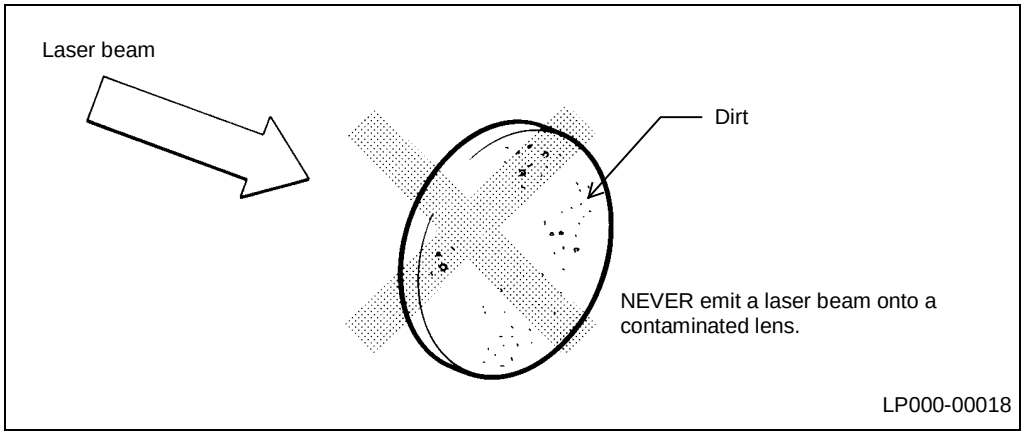


Fig. 10-4 Things not to do when handling lenses (4/6)

- Never use the convergent lens whose vapor deposition surfaces have begun to peel, or which have large scratches.
  In addition to the fact that the lens which is used in this condition will not deliver its full potential, the practice can be dangerous as well, in that it can cause unnecessary or scattered reflections of the laser beam. Scratches and peeled vapor deposition surfaces of the convergent lens can be repaired if the damage is slight. For repair of the lens, please consult Mazak's service engineers.

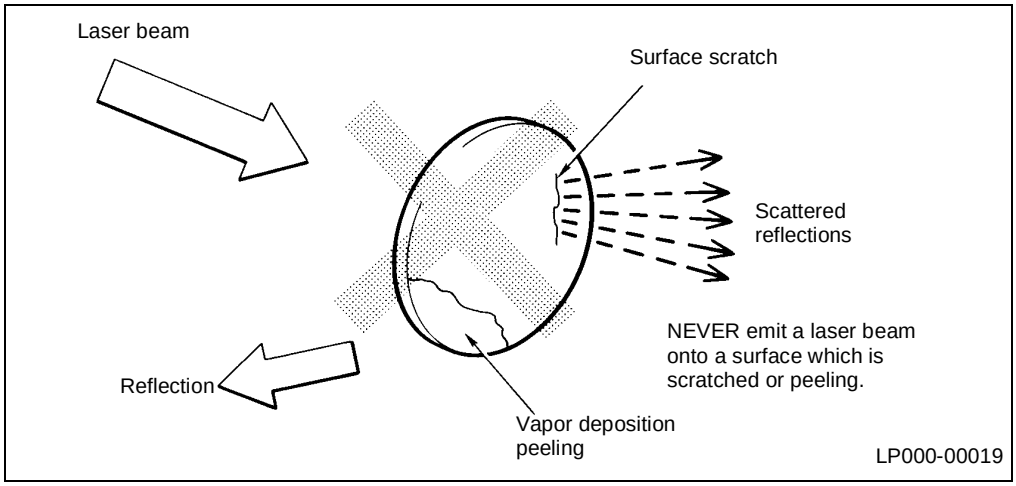


Fig. 10-5 Things not to do when handling lenses (5/6)

- Never apply excessive force to the convergent lens holder, and never treat it roughly.
  Lenses, mirrors, and other optical parts will fail to converge light properly if their shape is changed even if they are not scratched.

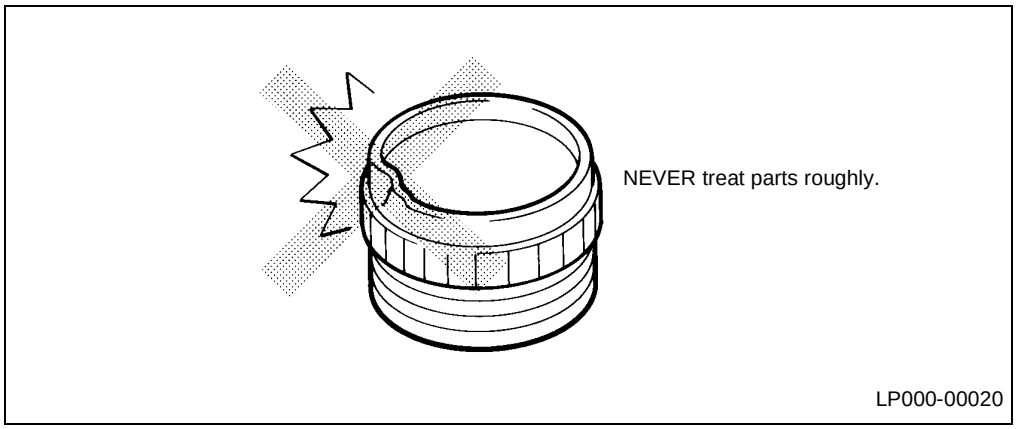


Fig. 10-6 Things not to do when handling lenses (6/6)

10-2 Clothing and Cautions on Handling the Convergent Lens

- Wear clean clothing free of steel particles and oily stains to eliminate the danger of contaminating the lens with dust and dirt.
- Tidy the hair and put on a cap to prevent hair or dandruff from falling onto the lens.
- Wear a mask to ensure that the lens is not contaminated by breath, saliva, etc.
- Wash your hands carefully and put on fingerstalls before handling lenses.

Fig. 10-7 Washing hands

Fig. 10-8 Using fingerstalls

- Hold the lens gently at its edges. Never touch the surface of the lens.
- Do not press on lenses from the top of the packaging. This could cause the lens to rub against the wrapping paper and be scratched.

10-3 Handling New Optical Parts

New optical parts have been manufactured under strictly controlled conditions, and have been carefully packaged. The mirror and lens will be in their cleanest state in this condition. In order to keep them in this state, the following precautions should be observed when dealing with new parts.

- When taking a lens from the case, take great care that it is not caught against the case and scratched.
- Do not press on the convergent lens from the top of the packaging. This could cause the lens to rub against the wrapping paper and be scratched.
- The convergent lens should always be picked up gently by the edge.
- Take care when removing wrapping paper from a lens so that the tape on the paper does not adhere to the back surface of the lens. Also be careful that no dusts fall from the paper onto the surface of the lens.
- After removing a lens from the packaging, always place it carefully on the wrapping paper.
- After a lens has been removed from the packaging, it should be cleaned of dirt and dust by a light blast of air from an air blower, or by using a micro duster. (This method should be sufficient as long as the lens is not particularly dirty. A variety of cleaning methods are noted below, but all of these involve touching the surface of the lens, and will thus inevitably lower the performance of the lens from what it should be as a new product.)
- Carefully clean the holder in which the lens is to be mounted with acetone. Any dirt on the holder can be transferred to the lens.
- Never use any unnecessary force on a lens when mounting it in the holder. The lens should be tightened in such a way that pressure is uniform all around it.
- After mounting a lens in the holder, blow the surface free of dirt and dust once more.

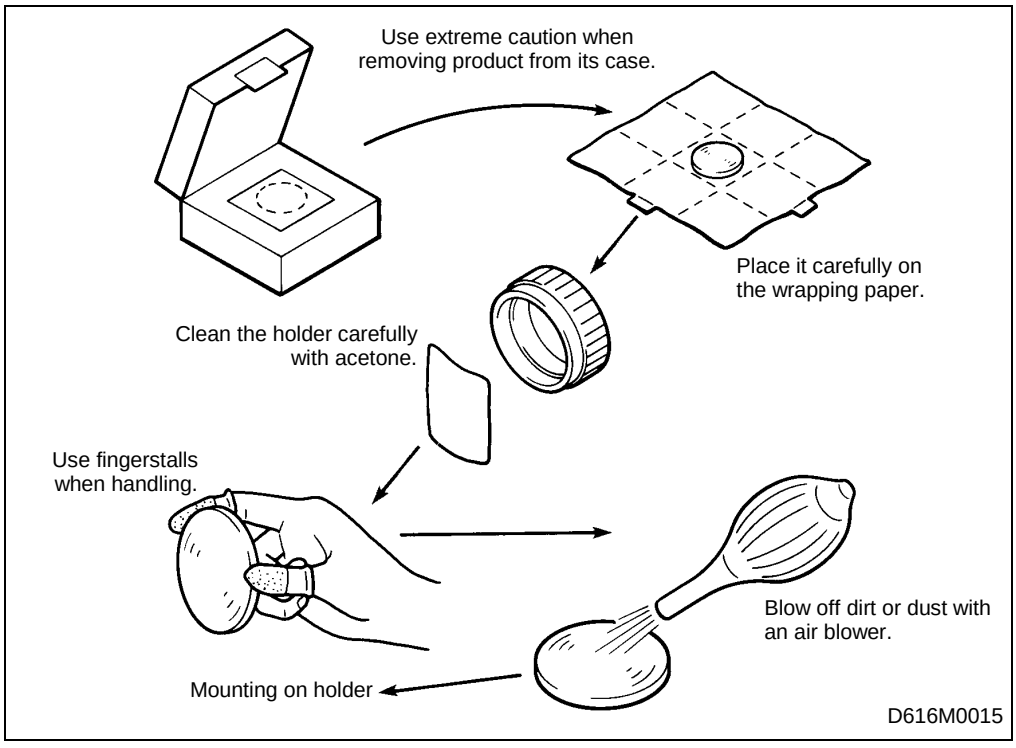


Fig. 10-9 Handling new optical parts

10-4 Cleaning the Convergent Lens

The convergent lens which is in use will gradually grow dirty as it is used, and this will cause its performance level to drop. It is therefore necessary to clean it occasionally to recover its full performance. The term “cleaning”, however, is somewhat misleading, because it involves the touching of the lens and hence is apt to cause scratches on the lens while it is being cleaned. For this reason, unnecessary cleaning should be avoided.
It must also be remembered that even the most efficient cleaning will not result in 100% recovery of the performance of the lens.
If the lens has not become very dirty and the dirty area is small, clean the lens without removing it from the holder. If the lens is very dirty and the dirty area is large, remove it from the holder to clean it.

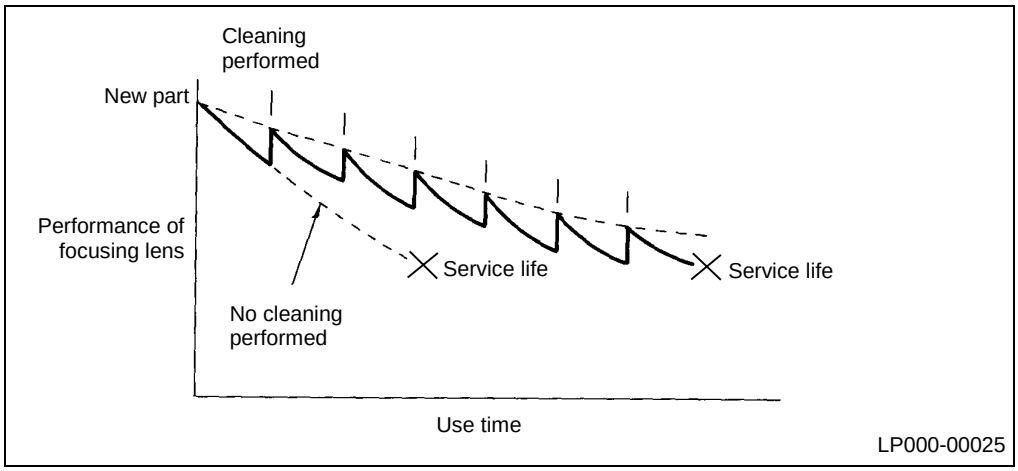


Fig. 10-10 Life of optical parts

Two cleaning methods are available: acetone cleaning and acetic acid + acetone cleaning.
The required method and interval of cleaning vary from workpiece to workpiece. See Item 2, “Cleaning interval”, for further details.

1. Characteristics of cleansing agents

Acetone: Removes water-soluble dirt and oils.
Acetic acid: Reduces zinc oxide chemically into zinc and water.

2. Cleaning interval

Workpiece material	Acetone cleaning	Acetic acid + acetone cleaning
Soft steel	Every 25 hours	Every 50 hours (see **Note 2**)
Stainless steel and aluminum Soft steel that generates a great deal of smoke	Every 10 hours	Every 20 hours (see **Note 2**)
Zinc-containing materials (e.g. galvanized steel plates)	—	Every 10 hours

Note 1: The above-listed intervals of cleaning are for reference only. It is recommended that acetone cleaning be executed each day.

Note 2: For soft steel in general, stainless steel and aluminum, and soft steel that generates a great deal of smoke, in particular, add an acetic acid cleaning process to every second periodic cleaning.

Note 3: Always perform acetic acid + acetone cleaning at the specified intervals for zinc-containing materials such as galvanized steel plates.

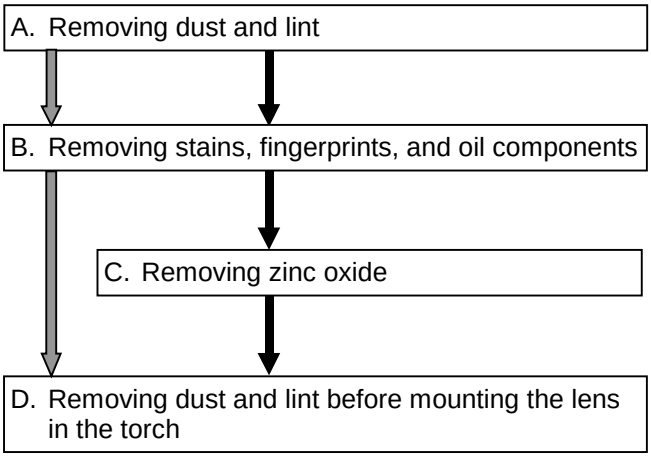
Note 4: Do not mix acetic acid and acetone. Mixing could result in explosion.

3. Precautions

Always handle the convergent lens with scrupulous care, as detailed below.

1. When handling the convergent lens, be sure to wear clean finger-stalls or gloves. The dirt or fat components on the skin could foul the lens, resulting in significant deterioration of performance.
2. When handling the convergent lens, do not use any tools, including tweezers.
3. Always place the convergent lens on the lens-use tissue paper (enclosed) to protect the surface.
4. Since the convergent lens gets damaged very easily, do not place it directly on a hard or rough surface.
5. It is not possible to remove metallic spatters or physical damage (e.g. a dent) from the convergent lens. Such a dirty or damaged lens should be replaced with a new one.

4. Flow of cleaning


A. Removing dust and lint
B. Removing stains, fingerprints, and oil components
C. Removing zinc oxide
D. Removing dust and lint before mounting the lens in the torch

⇨ Acetone cleaning (Daily execution is recommended.)

→ Acetic acid + acetone cleaning (See Item 2 above for cleaning interval. Moreover, use this cleaning method as a measure against the machining defects occurring even after acetone cleaning.)

Note 1: For a new lens, do not perform operations B and C above. New lenses are cleaned and then packed by the respective lens manufacturers to maintain as-shipped quality. If any dirt or visual defects are detected on a new lens, please immediately contact its manufacturer.

Note 2: Do not mix acetic acid and acetone. Mixing could result in explosion.

5. Cleaning procedures

A. Removing dust and lint

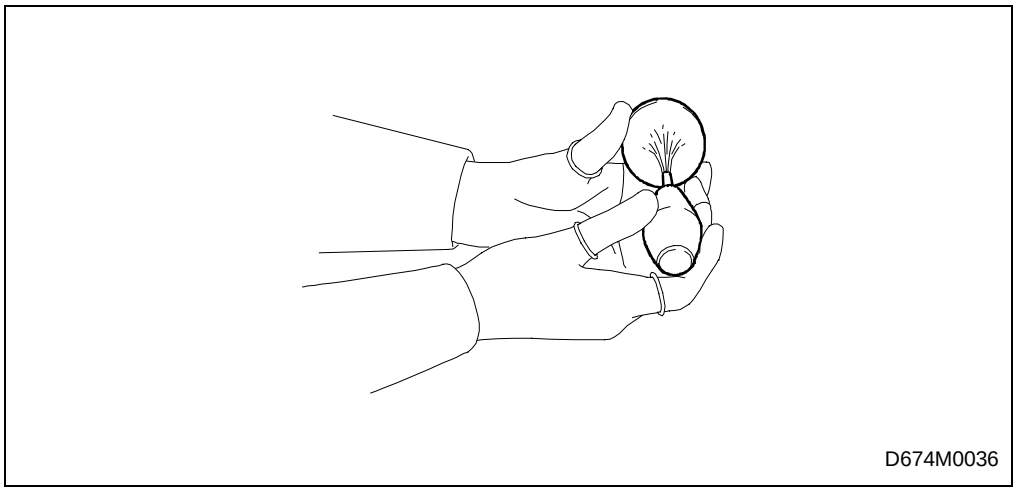


Fig. 10-11 Removing dust and lint

(1) Blow away dust and lint completely from the convergent lens surface using an air blower.

Note: Do not use an air spray in common use at work sites since it usually contains oils and moisture. Those impurities could form a detrimental absorption film on the surface of the convergent lens.

B. Removing stains, fingerprints, and oil components

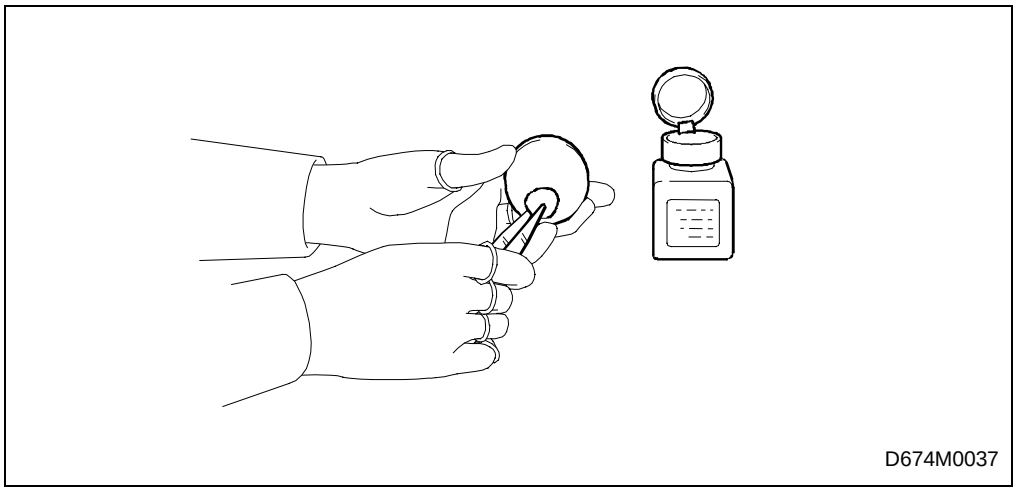


Fig. 10-12 Removing stains, fingerprints, and oil components

(1) Dampen absorbent cotton with acetone, and wipe the surface of the lens gently with the cotton. To prevent any wiping traces from being left on the lens surface, move the cotton transversely on the surface at such a speed as the solution (acetone) may evaporate immediately on the trace.

Note 1: Use only high-quality medical-use absorbent cotton.

Note 2: Use acetone at least 99% in purity.

C. Removing zinc oxide

See Item 2 above for cleaning interval. Moreover, use this cleaning method as a measure against the machining defects occurring even after acetone cleaning.

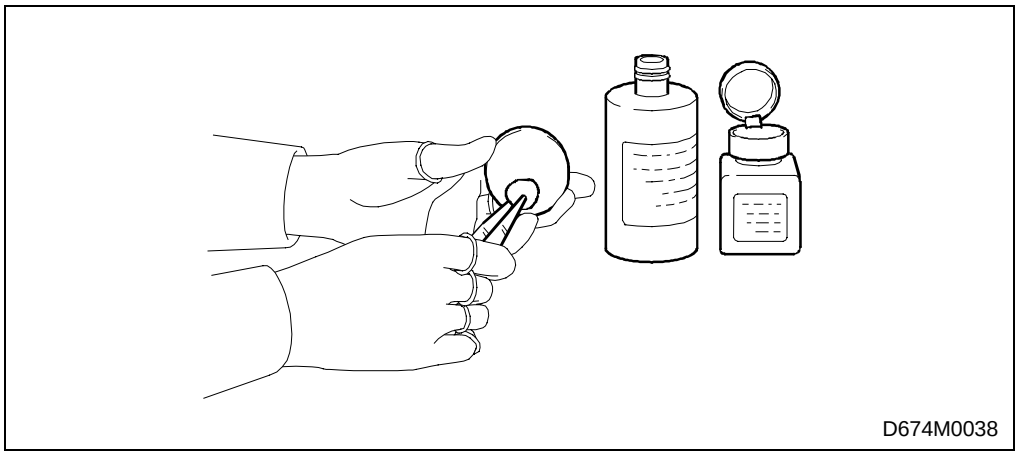


Fig. 10-13 Removing zinc oxide

(1) Dampen absorbent cotton with acetic acid (CH_3COOH), and wipe the lens surface with the cotton applying a light finger pressure. Next, wipe off excess of the acetic acid from the surface with clean and dry absorbent cotton.

(2) Finally wipe the lens surface gently with acetone-dampened absorbent cotton to remove the acetic acid completely.

Note 1: Use only high-quality medical-use absorbent cotton.

Note 2: Use acetone at least 99% in purity.

Note 3: Use acetic acid diluted to a concentration of 6% or less.

Note 4: Do not mix acetic acid and acetone. Mixing could result in explosion.

D. Removing dust and lint before mounting the lens in the torch

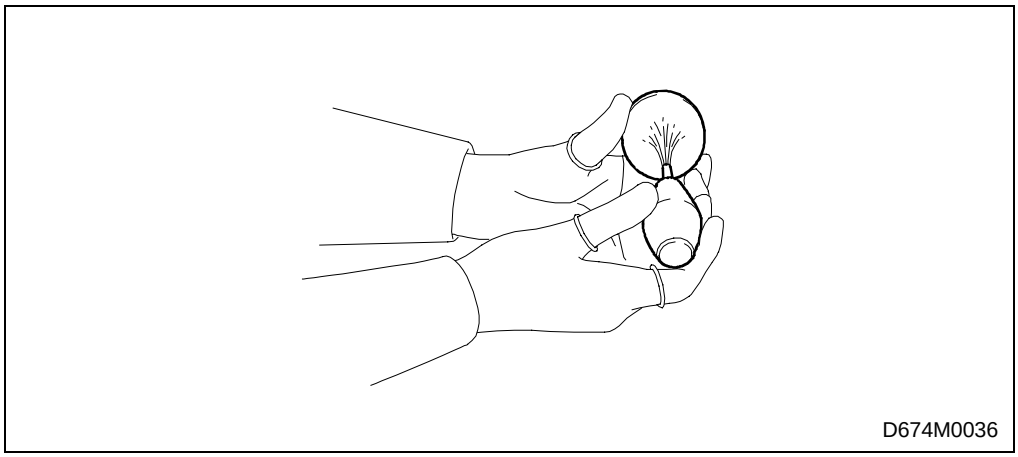


Fig. 10-14 Removing dust and lint before mounting the lens in the torch

(1) Before mounting the convergent lens in the torch, blow away all dust and lint from the lens surface using an air blower.

Do not use an air spray in common use at work sites since it usually contains oils and moisture. Those impurities could form a detrimental absorption film on the surface of the convergent lens.

10-5 Storing the Convergent Lens

Convergent lenses are not only very expensive, but also extremely sensitive to dirt. It is therefore very important to take great care in their storage.

1. Storage location and environment

- A storage location that is easy to manage and not accessible to unrelated personnel should be selected. If a convergent lens is touched accidentally, it could easily be damaged.
- Convergent lenses should be stored in a location where the temperature is constantly between 10 and 30°C (50 and 86°F), and the difference between the temperature of the storage area and the room temperature should be kept to a minimum. (DO NOT keep lenses in a refrigerator or similar environment. Condensation may occur when they are taken out.)
- The relative humidity of the storage area should be kept at 30% or lower.
- Lenses should always be kept in their cases when they are in storage. If lenses are left unprotected, dust will adhere to the surface of the lens. (This is true even when lenses are in desiccators. Dust can settle on a lens when the lid is opened and closed.)
- Do not subject lenses to shock while they are in storage. This could distort the convergent lens or its holder.

10-6 Disposal of the Convergent Lens

DANGER

- Do not dispose of the lenses, the output mirror, or the final-stage mirror together with general garbage, even after these parts become unnecessary. Burning these parts in an incinerator, in particular, is strictly prohibited. The gases arising from the combustion of these gases are extremely poisonous and if inhaled, can result in fatal accidents.
- Ask a licensed industrial waste treatment company to dispose of the lenses, the output mirror, and the final-stage mirror.

11 MAINTENANCE OF THE INTELLIGENT LOOP SYSTEM

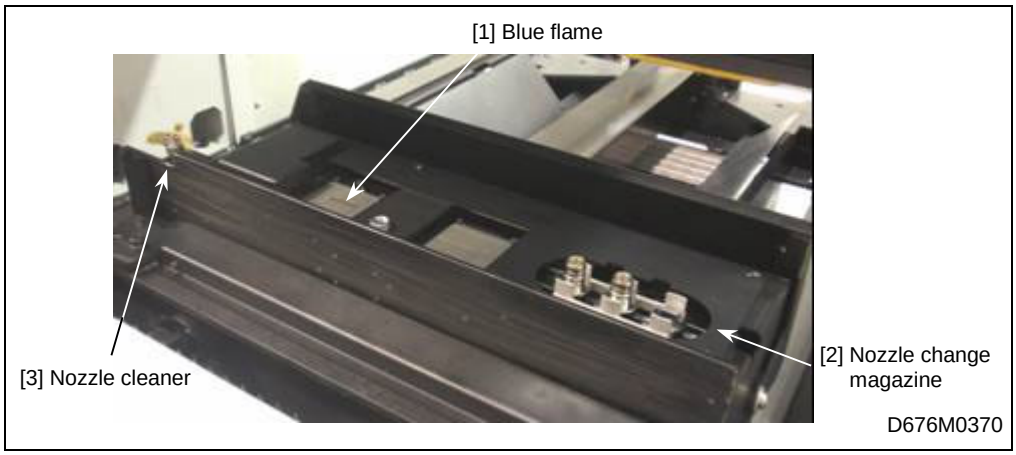
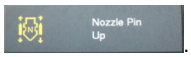
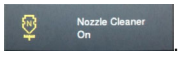


Fig. 11-1 Maintenance of the intelligent loop system

Maintenance and check items vary from function to function. Execute the appropriate maintenance and check items in accordance with the following list:

List of inspection items

No.	Equipment/ Function	Inspection item	Remarks	Measure
1	Calibration	Check whether the plate is dirty.	As required	
		Updating of the calibration Z-coordinate	Monthly	Refer to 11-1-1.
2	Blue flame	- Check whether an area in which the blue flame detection can be executed is left. - Check whether the plate is dirty.	As required	
		Check whether alarm **1101 CHANGE STAINLESS PLATE** is occurring.	When an alarm occurs	Refer to 11-2-1.
		Check whether the window is dirty.	Monthly	Refer to 11-2-2.
		Updating the Z-coordinate of the blue flame detection	Monthly	Refer to 11-2-3.
3	Nozzle change magazine	Check for sputter or dust and dirt deposits.	Monthly	Refer to 11-3-1.
		Check whether the nozzle pin moves upward. **Confirmation method:** 1) Press the SWITCH key . 2) Press Nozzle Pin Up  .	As required	If no motion occurs, contact Mazak Technical Center or Technology Center.
		Check for mismatching between the nozzle on the **TOOL DATA** screen and the actually set nozzle.	As required	Refer to 1-3-1 of the Operating Manual for the Intelligent Loop System.
4	Nozzle cleaner	- When grinder length decreases below 8 mm (0.31 in) - When the bristles on the brush collapse - When the bristles on the brush are lost significantly - When a sputter sticks to the brush	As required	Refer to “11-4-1 Replacing the nozzle cleaner”.
		When the bristles collapse	—	Refer to “11-4-2 Adjusting the brush contact amount precisely”.
		Check whether the nozzle cleaner rotates properly. **Confirmation method:** 1) Press the SWITCH key . 2) Press Nozzle Cleaner On  .	As required	If no motion occurs, contact Mazak Technical Center or Technology Center.

11-1 Automatic Calibration Function

11-1-1 Updating the calibration Z-coordinate

In order to ensure the stable operation of the automatic calibration function of the torch, it is necessary to check and adjust the position where the calibration operation starts.

1. Cycle of adjustment

Check and adjust it once a month or so.

2. Tools and materials required

- Torch, nozzle (nozzles of any diameter will do if they are not broken and have no spatter on them.)
- Calibration plate

3. Procedure

(1) Mount the torch and the nozzle.

Enable the profiling function.

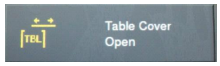
(2) Select home return mode and return all axes to the respective home positions.

Note: The table cover (cover of the Optipod) will not open unless the Z-axis is at its zero point.

(3) Open the table cover.

1) Press the SWITCH key

to open the **SWITCH** screen.

2) On the **SWITCH** screen set Table Cover Open 

to ON.

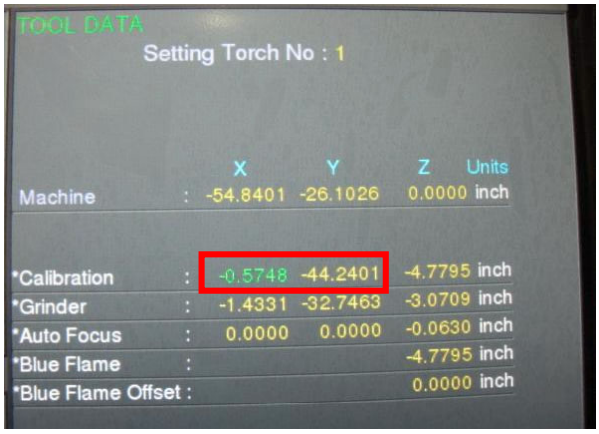
(4) Open the operator door.

(5) Open the **TOOL DATA** screen, and move the X- and Y-axes (but not the Z-axis) to the **Calibration** position.

1) Press **[TOOL]**

.

2) Move the X- and Y-axes (but not the Z-axis) to the **Calibration** position shown below.

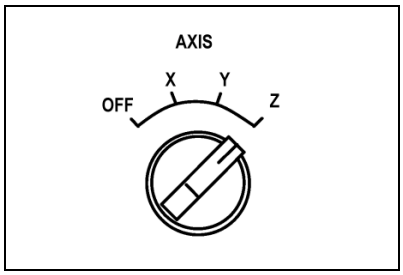

TOOL DATA
Setting Torch No : 1
X Y Z Units
Machine : -54.8401 -26.1026 0.0000 inch
*Calibration : -0.5748 -44.2401 -4.7795 inch
*Grinder : -1.4331 -32.7463 -3.0709 inch
*Auto Focus : 0.0000 0.0000 -0.0630 inch
*Blue Flame : -4.7795 inch
*Blue Flame Offset : 0.0000 inch

(6) Lower the Z-axis slowly to bring the tip of the nozzle into contact with the surface of the calibration plate.

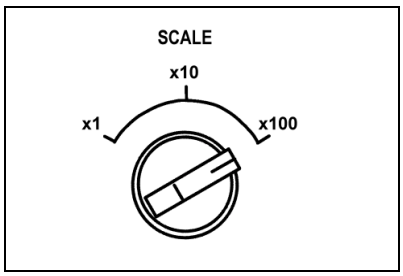
1) Press the HANDLE key

of mode selection.

2) Turn the handle axis selection switch to “Z”.

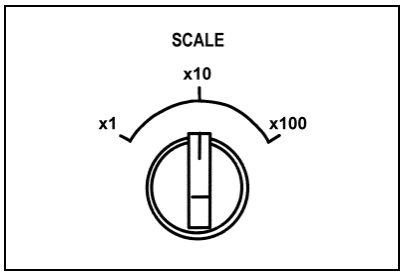


3) Turn the handle multiplier selection switch to “×100”.
(This setting designates that the unit of feed by turning the handle by one division is 0.1 mm or 0.01 in.)



4) Turn the handle to the “–” direction so as to move down the Z-axis (torch), and to stop it at the position where the nozzle tip is at a height of about 1 to 2 mm (0.039 to 0.079 in) from the surface of the calibration plate.

5) Turn the handle multiplier selection switch to “×10”.
(This setting designates that the unit of feed by turning the handle by one position is 0.01 mm or 0.001 in.)



6) Insert a thin sheet of paper, such as copy paper, between the calibration plate and the nozzle and lower the torch to such an extent that the paper does not move even if it is pulled.

7) Turn the handle 2 or 3 graduations in the “+” direction to remove the paper.

8) Lower the torch gradually by turning the handle one graduation at a time, and stop it when the nozzle has come into contact with the calibration plate and the **AUTO GAP CONTROL ALARM** is displayed on the screen.

Note: In some cases, it may take 2 or 3 seconds for the alarm to be displayed after the contact.

(7) Open the **TOOL DATA** screen and move the cursor to the Z-axis position in the **Calibration** line.

Click **TOOL_DATA** and move the cursor, using cursor keys.

When a numeric value is pointed to with the cursor, it is highlighted in green.

(8) Press **[TEACH]**.

(9) Press **[CONFIRM]**. (Do not change the numeric value displayed.)

The current Z-axis coordinate is saved as the calibration Z-axis coordinate.

(10) Press the reset key

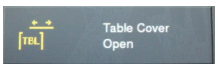
to turn off the alarm.

(11) Retract the torch in the “+” direction by turning the handle. (+100 mm or so)

(12) Close the operator door.

(13) Select home return mode and return axes to the respective home positions.

(14) Close the table cover.

- On the **SWITCH** screen set Table Cover Open 

to OFF.

11-2 Focal Distance Automatic Measuring and Correcting Function

Note: To operate the focal distance automatic measuring and correcting function properly, the lens holder must be mounted in the reference position. See Section 9-5 and mount the holder in the reference position.

11-2-1 Replacing the plate

If the plate surface runs out of the space available for executing the blue flame detection, alarm **1101 CHANGE STAINLESS PLATE** will appear on the monitor and the machine will enter a feed hold status. Replace the plate with the required one as directed below.

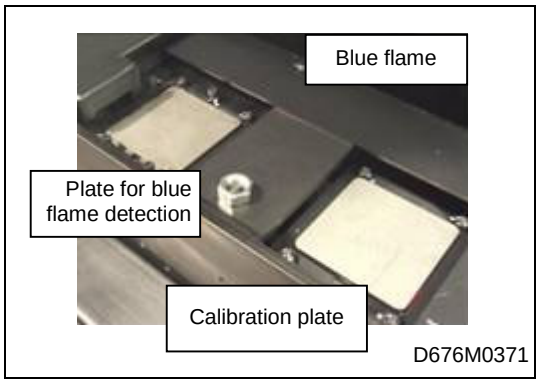


Fig. 11-2 Replacing the plate

1. Replacement timing

When alarm **1101 CHANGE STAINLESS PLATE** is displayed.

2. Tools and materials required

Plate: 46143304232

3. Procedure

(1) Open the operator door.

(2) Replace the plate of the blue flame detection.

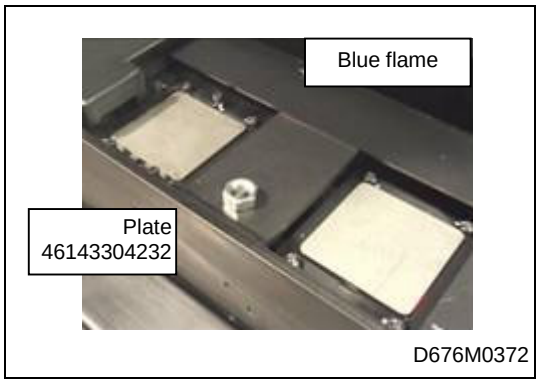


Fig. 11-3 Replacing the plate

(3) Close the operator door.

(4) Press once the clear key [CAN] (see Note below). This clears the display of alarm **1101 CHANGE STAINLESS PLATE**.

(5) Press the cycle start button

to restart the blue flame program.

Note: Do not press the reset key

. A press of the reset key does not allow counter parameter **L079** to be changed properly. If the reset key has been pressed, the counter parameter must be cleared to “0”; change this parameter as directed below.

<Procedure>

1) Press the PARAM. key

of screen selection.
2) Open the **INTELLIGENT USR** page.
3) Use the page-down key

to display the second page.
4) Change the setting of **L079** to “0”.
   - Move the cursor to **L079** using the pointing device, and double-click on **L079**.
   - Enter “0” and press **[CONFIRM]**.

11-2-2 Cleaning the window

Focal length cannot be measured properly if the window is dirty.

Clean the window as directed below.

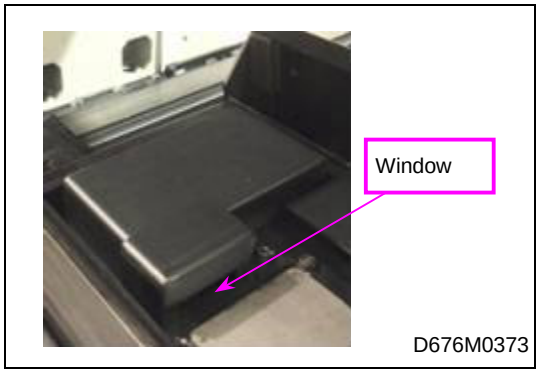


Fig. 11-4 Cleaning the window

1. Cleaning interval

Clean the window periodically. The cleaning period differs according to operating environment. Cleaning at least once a month is suggested.

2. Tools and materials required

Wrench and clean cloth

3. Procedure

(1) Select home return mode and return all axes to the respective home positions. (Note 1)

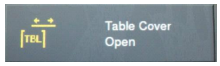
- Press the HOME key

of mode selection, and press the all-axes homing button

.

(2) Open the table cover.

1) Press the SWITCH key

to open the **SWITCH** screen.
2) On the **SWITCH** screen set Table Cover Open 

to ON.

(3) Open the operator door.

(4) Remove one screw, and remove the cover.

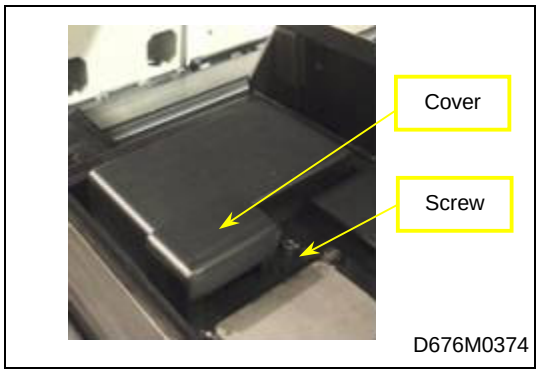


Fig. 11-5 Removing the cover

(5) Dry-wipe the window with a clean cloth. (Note 2)

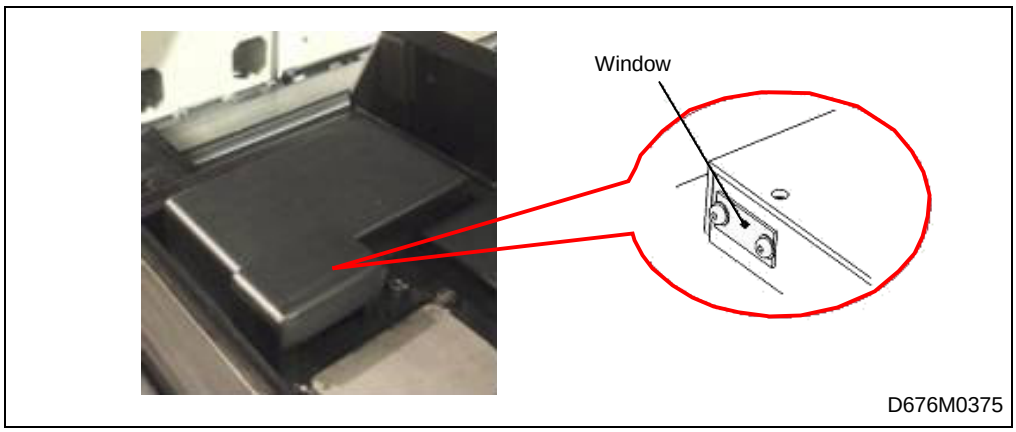
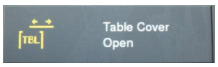


Fig. 11-6 Cleaning the window

(6) Mount the cover.

(7) Close the operator door.

(8) Close the table cover.

- On the **SWITCH** screen set Table Cover Open 

to OFF.

Note 1: The table cover (cover of the Optipod) will not open unless the Z-axis is at its zero point.

Note 2: Do not use an organic solvent (such as acetone or thinner) to wipe the window. Organic solvents melt the window.

11-2-3 Updating the Z-coordinate of the blue flame detection

In order to ensure the stable operation of the blue flame detection function of the torch, it is necessary to check and adjust the position where the blue flame operation starts.

1. Cycle of adjustment

Check and adjust the operation start position once a month or so.

2. Tools and materials required

- Torch, nozzle (nozzles of any diameter will do if they are not broken and have no spatter on them.)
- Blue flame detection plate

3. Procedure

(1) Select home return mode and return all axes to the respective home positions.

- Press the HOME key

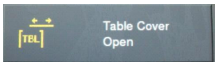
of mode selection, and press the all-axes homing button

.

(2) Open the table cover (cover of the Optipod).

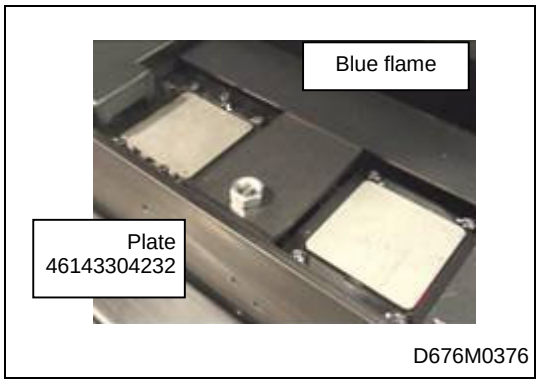
1) Press the SWITCH key

to open the **SWITCH** screen.

2) On the **SWITCH** screen set Table Cover Open 

to ON.

(3) Move the X- and Y-axes (but not the Z-axis) to the position of the blue flame detection plate.



1) Press the PARAM. key

of screen selection.

2) Open the **INTELLIGENT_MC** page.

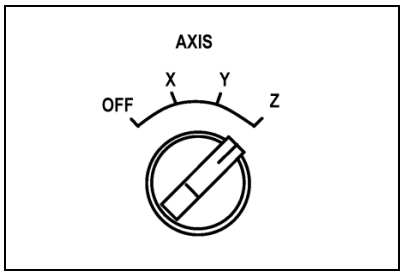
3) Move the X- and Y-axes (but not the Z-axis) to the position of the blue flame detection.
X-axis = **J370**, Y-axis = **J371**

(4) Lower the Z-axis slowly to bring the tip of the nozzle into contact with the surface of the blue flame detection plate.

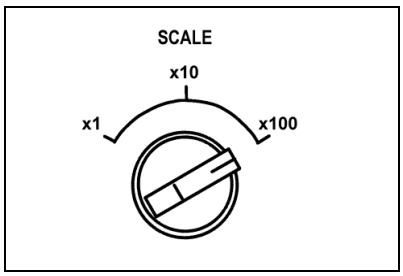
1) Press the HANDLE key

of mode selection.

2) Turn the handle axis selection switch to “Z”.

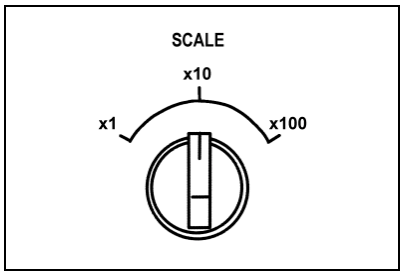


3) Turn the handle multiplier selection switch to “×100”.
(This setting designates that the unit of feed by turning the handle by one division is 0.1 mm or 0.01 in.)



4) Turn the handle to the “–” direction so as to move down the Z-axis (torch), and to stop it at the position where the nozzle tip is at a height of about 1 to 2 mm (0.039 to 0.079 in) from the surface of the blue flame detection plate.

5) Turn the handle multiplier selection switch to “×10”.
(This setting designates that the unit of feed by turning the handle by one position is 0.01 mm or 0.001 in.)



6) Insert a thin sheet of paper, such as copy paper, between the blue flame detection plate and the nozzle and lower the torch to such an extent that the paper does not move even if it is pulled.

7) Turn the handle 2 or 3 graduations in the “+” direction to remove the paper.

8) Lower the torch gradually by turning the handle one graduation at a time, and stop it when the nozzle has come into contact with the blue flame detection plate and the **AUTO GAP CONTROL ALARM** is displayed on the screen.

Note: In some cases, it may take 2 or 3 seconds for the alarm to be displayed after the contact.

(5) Open the **TOOL DATA** screen, and move the cursor to **Z** in the **Blue Flame** line.

1) Press **[TOOL]**

.

2) Click **TOOL_DATA** and move the cursor, using cursor keys.
When a numeric value is pointed to with the cursor, it is highlighted in green.

(6) Press **[TEACH]**.

(7) Press **[CONFIRM]**. (Do not change the numeric value displayed.)

The current Z-axis coordinate is saved as the blue flame Z-axis coordinate.

(8) Press the reset key

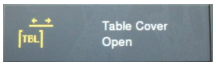
to turn off the alarm.

(9) Retract the torch in the "+" direction by turning the handle. (+100 mm or so)

(10) Close the operator door.

(11) Select home return mode and return all axes to the respective home positions.

(12) Close the table cover.

- On the **SWITCH** screen set Table Cover Open 

to OFF.

Note: The table cover (cover of the Optipod) will not open unless the Z-axis is at its zero point.

11-2-4 Adjusting the lens holder position

To operate the focal distance automatic measuring and correcting function properly, the lens holder must be mounted in the reference position. See Section 9-5 and mount the holder in the reference position.

11-3 Nozzle Change Magazine

11-3-1 Cleaning the nozzle holder

The deposition of sputters, dust and dirt, or other foreign substances results in improper nozzle setup and hence in a nozzle-changing failure.

Clean the nozzle holder as directed below.

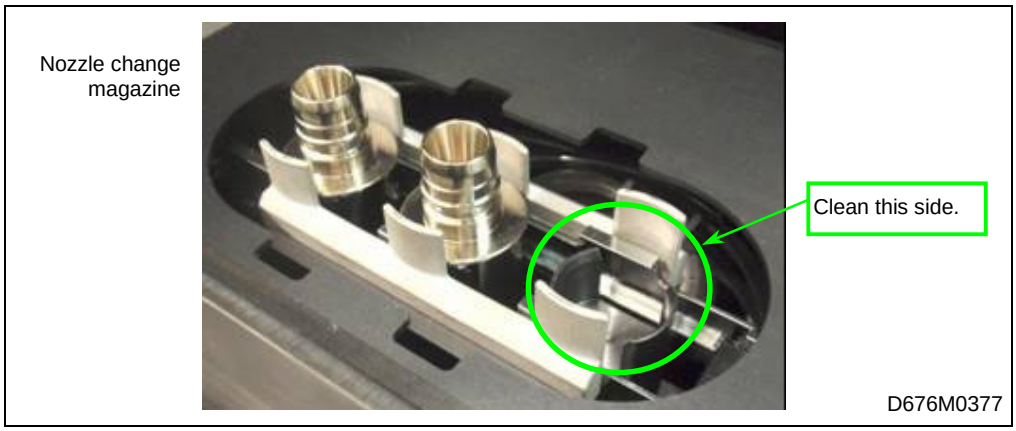


Fig. 11-7 Cleaning the nozzle holder

1. Cleaning interval

Clean periodically. The cleaning period differs according to operating environment. Cleaning at least once a month is suggested.

2. Tools and materials required

Vacuum cleaner

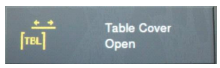
3. Procedure

(1) Select home return mode and return all axes to the respective home positions (see Note).

(2) Open the table cover.

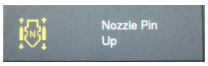
1) Press the SWITCH key

to open the **SWITCH** screen.

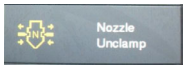
2) On the **SWITCH** screen set Table Cover Open 

to ON.

(3) Unclamp the nozzle (see Note).

1) On the **SWITCH** screen set Nozzle Pin Up 

to ON.

2) On the **SWITCH** screen set Nozzle Unclamp 

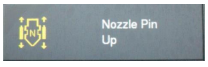
to ON.

(4) Open the operator door.

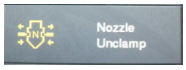
(5) Remove one nozzle, clean the nozzle holder with a vacuum cleaner, and remount the nozzle. Clean all nozzles.

(6) Close the operator door.

(7) Clamp the nozzle (see Note).

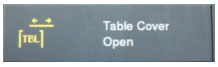
1) On the **SWITCH** screen set Nozzle Pin Up 

to OFF.

2) On the **SWITCH** screen set Nozzle Unclamp 

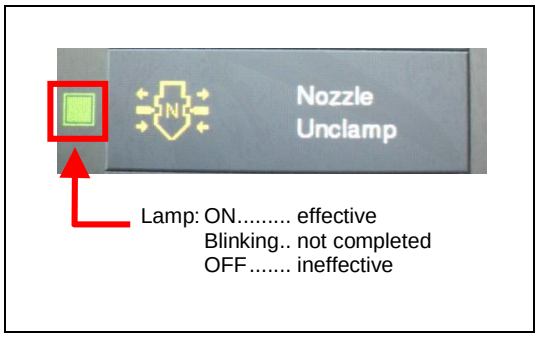
to OFF.

(8) Close the table cover.

- On the **SWITCH** screen set Table Cover Open 

to OFF.

Note: If the **Nozzle Pin Up** or **Nozzle Unclamp** lamp is blinking, the operation is not yet completed. If this is the case, check if the nozzle interferes with the operation due to its improper setting.



11-4 Nozzle Sputter Removal System (Nozzle Cleaner)

11-4-1 Replacing the nozzle cleaner

Deteriorated brush cannot remove sputters.

The use of a nozzle cleaner whose grinder length L is less than 8 mm (0.31 in) leads to nozzle damage.

Replace the nozzle cleaner as directed below.

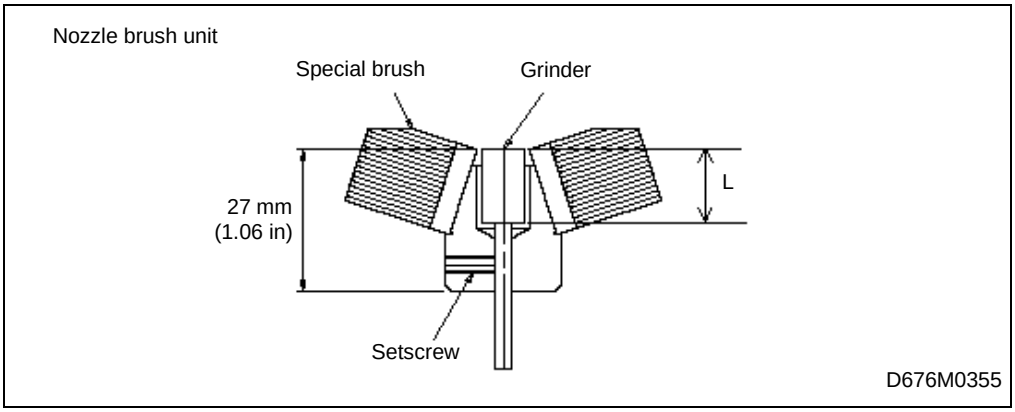


Fig. 11-8 Replacing the nozzle cleaner

1. Replacement timing

- When grinder length L decreases below 8 mm (0.31 in) [when new: L = 13 mm (0.51 in)]
- When the bristles on special brush collapse
- When the bristles on the special brush are lost significantly
- When a sputter sticks to the special brush

2. Tools and materials required

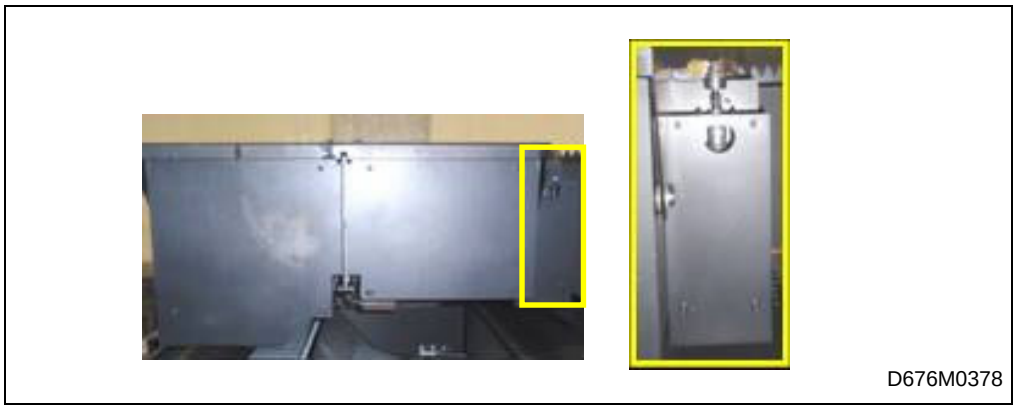
- Nozzle brush unit

Grinder	P40JJ000150
Special brush	46143311640

- General-purpose wrench
- Special wrench
- Copy sheet (or equivalent thin sheet of paper)

3. Procedure

(1) Select home return mode and return all axes to the respective home positions.



(2) Press the emergency stop button and check to make sure that the axes cannot be moved.

(3) Remove the nozzle brush unit.

- While holding down the lock button at the locking position of rotation, turn the chuck with a general-purpose wrench and remove the nozzle brush unit.

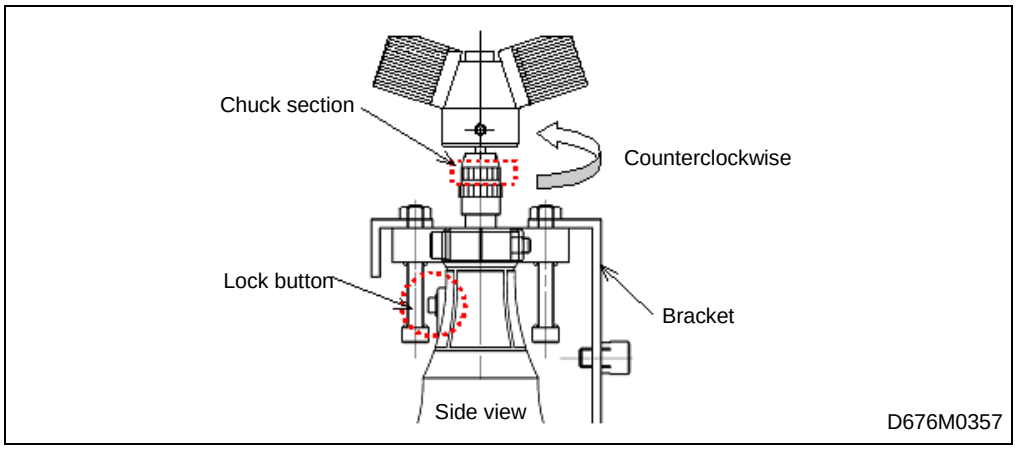
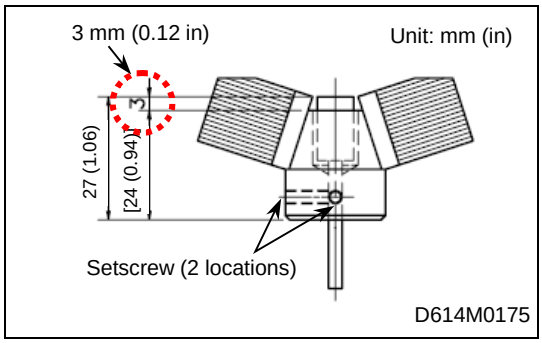


Fig. 11-9

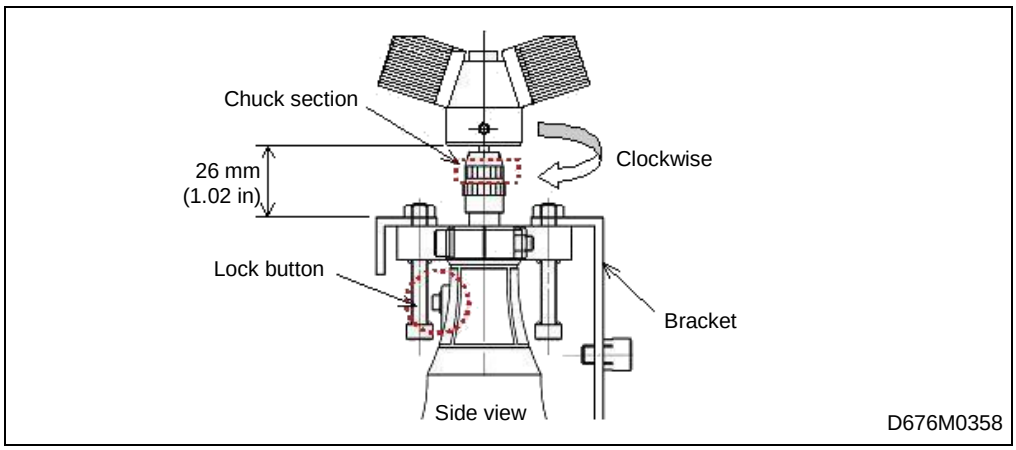
(4) Replace the grinder or the special brush.

- Fix the nozzle brush unit using the two setscrews for a distance of 3 mm (0.12 in) between the upper end of the grinder and the top of the special brush shaft.



(5) Mount the nozzle brush unit whose grinder or special brush was replaced in step (4).

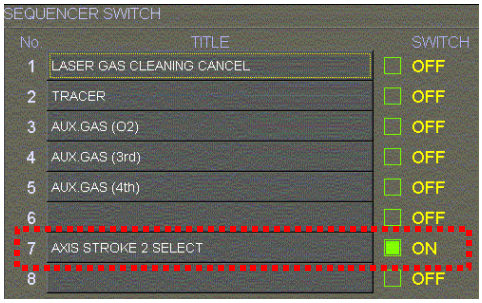
- While holding down the lock button at the locking position of rotation, turn the chuck with a special wrench and mount the nozzle brush unit for a distance of 26 mm (1.02 in) between the upper end of the bracket and the lower end of the special brush.



(6) Clear the emergency stop status.

(7) Select **AXIS STROKE 2 SELECT**.

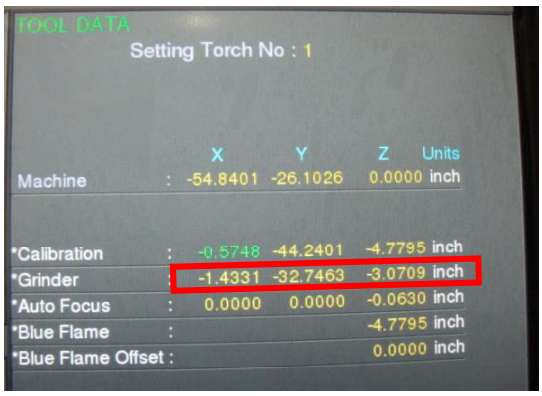
- Press the SWITCH key to open the **SWITCH** screen.
- On the **SWITCH** screen set **AXIS STROKE 2 SELECT** to ON.



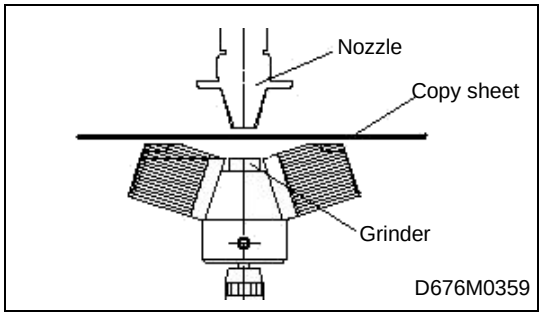
(8) Adjust the positions of the nozzle and the grinder.

Move the X- and Y-axes to the center of the grinder, and move the Z-axis to a position at which the upper end of the grinder and the nozzle end come into contact (see the Note below for this position). Assign the machine coordinates of each axis at this time to the **TOOL DATA** screen. For the assignment method, refer to the MAZATROL RPEVIEW Operating Manual, Section 3-17, “Modifying the User Parameter Setting (Nozzle Position Data)”.

Take this recorded position as a reference position.


TOOL DATA
Setting Torch No : 1
X Y Z Units
Machine : -54.8401 -26.1026 0.0000 inch
*Calibration : -0.5748 -44.2401 -4.7795 inch
*Grinder : -1.4331 -32.7463 -3.0709 inch
*Auto Focus : 0.0000 0.0000 -0.0630 inch
*Blue Flame : -4.7795 inch
*Blue Flame Offset : 0.0000 inch

Note: Place a copy sheet on the grinder, lower the Z-axis in handle mode (×10), and take the position where the sheet gets stuck between the nozzle and the grinder, as a contact position.



(9) Move the torch through “Y = 32, Z = –9” from the reference position.

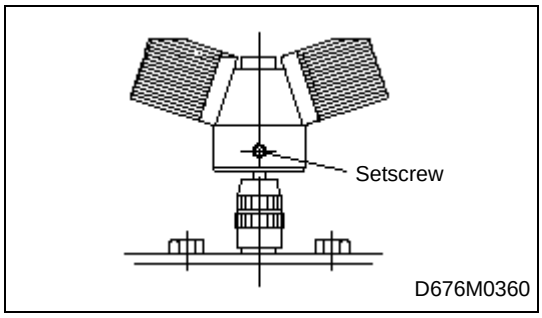
(10) Confirm whether the special brush rotates at the position to which the torch was moved in step (9).

- Rotate the brush by hand.

(11) If the brush does not rotate, adjust brush height for the proper rotation, and then fix the nozzle brush unit using the required setscrew.

- Before working inside the machine, press the emergency stop button without fail.

Note: Perform adjustments for the brush to be positioned immediately close to the nozzle. Too small a clearance with respect to nozzle accelerates the deterioration of the brush and/or causes the center of the nozzle to shift. Lowering the brush too much makes it impossible to completely remove any sputters sticking to the nozzle.



(12) Confirm the settings of parameters.

- Press the PARAM. key [PARAM.] to open the L-parameter page.
- Assign 0 to parameters **L046** and **L047**.

For the assignment method, refer to the MAZATROL PREVIEW Operating Manual, Section 3-16, “Checking and Modifying the User Parameters”.

Address	Contents	Unit	Default setting
L046	Nozzle-brush contact amount, Y	mm	0
L047	Nozzle-brush contact amount, Z	mm	0

(13) Select home return mode and return all axes to the respective home positions.

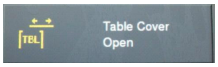
1) Turn the handle to retract the Z-axis before homing of all axes.

2) Press the HOME key

of mode selection, and press the all-axes homing button

.

(14) Close the table cover.

- On the **SWITCH** screen set Table Cover Open 

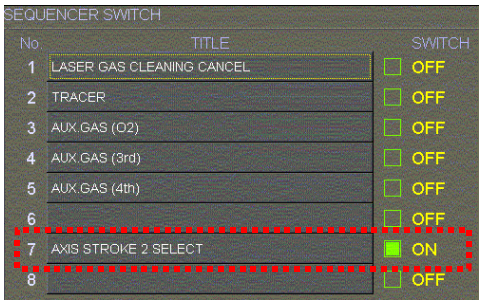
to OFF.

(15) Turn off **AXIS STROKE 2 SELECT**.

- Press the SWITCH key

to open the **SWITCH** screen.

- On the **SWITCH** screen set **AXIS STROKE 2 SELECT** to OFF.



(16) Select home return mode and return all axes to the respective home positions.

- Press the HOME key

of mode selection, and press the all-axes homing button

.

11-4-2 Adjusting the brush contact amount precisely

In cases such as brush wear, the contact amount between the brush and the nozzle can be adjusted using the required user parameters.

1. Adjustment timing

When the bristles on the brush collapse

Note: Replace the brush if wear cannot be compensated for within the setting range concerned.

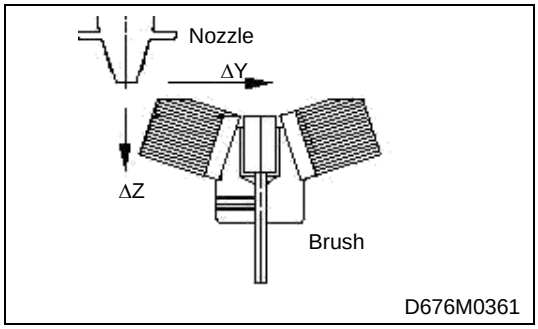
2. Procedure

(1) Move the nozzle to the position described in step (9) of Subsection 11-4-1.

That is, move the nozzle to the position to which the torch was moved through (Y = +32 mm, Z = –9 mm) from the nozzle grinder reference position described in step (8) of Subsection 11-4-1.

(2) Adjust the nozzle-to-brush clearance as follows by editing the settings of parameters:

When the nozzle is not in contact with the brush



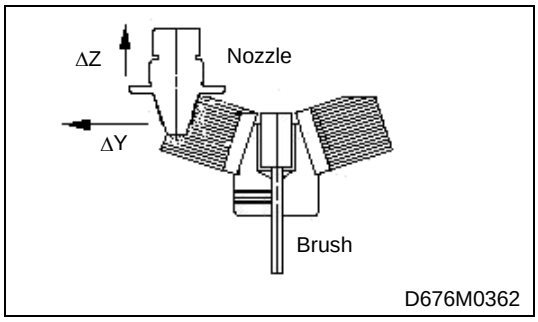
Example of setting:

ΔY = 0.5 mm, ΔZ = 1 mm
Enter parameters as follows to bring the nozzle close to the brush:

L046 = –0.5
L047 = –1.0

To increase the contact amount between the nozzle and the brush, assign minus data to the parameters.

When the nozzle is too much in contact with the brush



Example of setting:

ΔY = 0.5 mm, ΔZ = 1 mm
Enter parameters as follows to move the nozzle away from the brush:

L046 = 0.5
L047 = 1.0

To reduce the contact amount between the nozzle and the brush, assign plus data to the parameters.

Address	Contents	Unit	Setting range
L046	Nozzle-brush contact amount, Y	mm	–2 ≤ **L046** ≤ 2
L047	Nozzle-brush contact amount, Z	mm	–2 ≤ **L047** ≤ 2

For the assignment method, refer to the MAZATROL PREVIEW Operating Manual, Section 3-16, “Checking and Modifying the User Parameters”.

Note: Replace the brush if wear cannot be compensated for within the setting range concerned.

- NOTE -

12 REMOTE CONTROL CONNECTOR (CLASS IV SYSTEM)

12-1 Description

A remote control connector is provided so that the user can connect a remote barrier interlock, emergency stop switch, or similar device.

12-2 Function

When the remote control connector is open, the following items will occur.

1. Auto operation

1. Feed hold (machine will stop.)
2. Closing of beam shutter
3. Discharge off
4. Misoperation alarm No. 9 message.

2. Manual operation

1. Closing of beam shutter
2. Discharge off.
3. Misoperation alarm No. 9 message.

12-3 How to Release Interlock

1. Close the remote control connector.
2. Push the reset key.

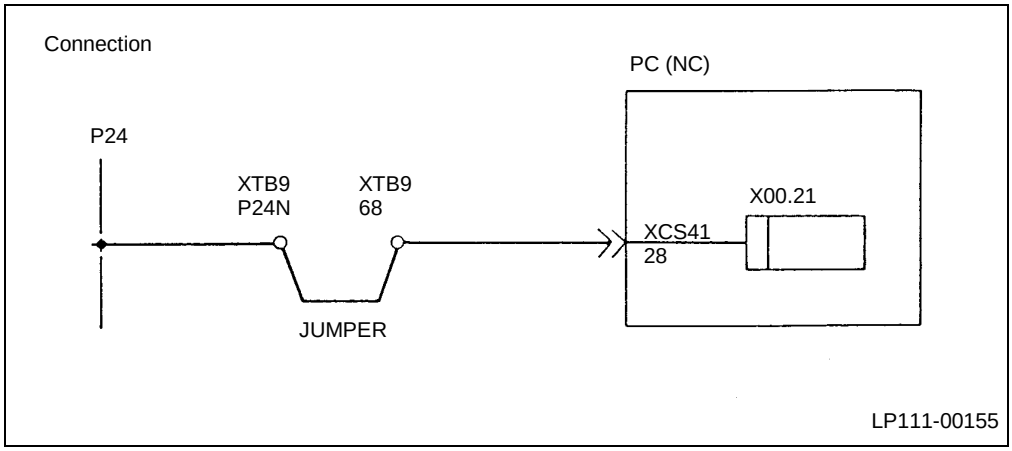
12-4 Connection

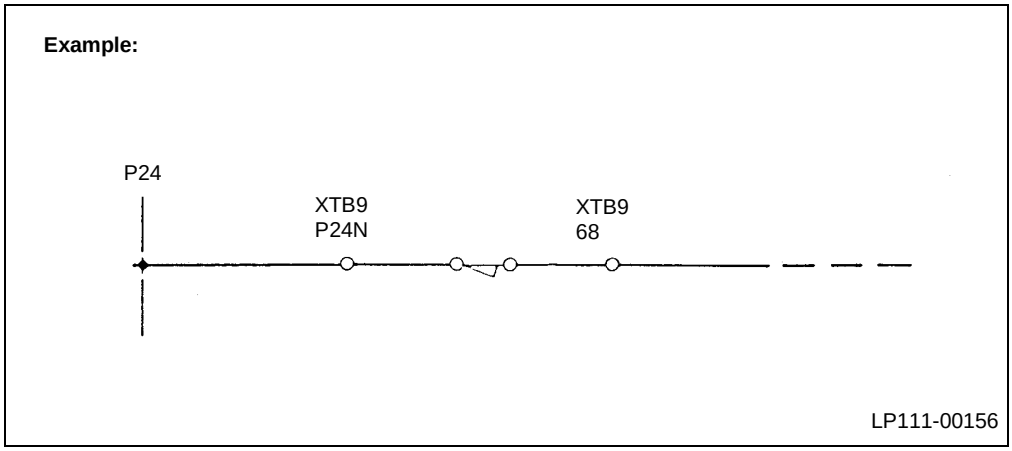
Switch the main power switch (main power breaker handle) to the OFF position.

Before connecting a limit switch for remote control, first remove the jumper wire between P24N and 68 of terminal block XTB9.

The limit switch to be used here must be the normally ON type. The limit switch must open when the limit is detected.

If P24N-68 of XTB9 is opened, an interlock function is activated.





13 ALARM LIST

13-1 Description

When any failure occurs in the machine or when any erroneous operation is made, an alarm number and the related alarm message are displayed in the alarm message display area in the screen. If an alarm occurs, check the cause of the alarm in the alarm list and clear the alarm by following the appropriate remedy. As more than one alarm may occur depending on the situation, be sure to check them on the **ALARM** screen.

1. Configuration of the alarm list

No.	Message	Resetting method
[1]	[2] (, ,)	[3]
Cause	[4]	
Action	[5]	

[1]: Alarm No.

[2]: Alarm message

[3]: Resetting methods:

Code	Clearing procedure
A	Power OFF → Eliminating the cause → Power ON
B	Eliminating the cause → Power OFF → Power ON
C	Eliminating the cause → Pressing the reset key
D	Pressing the reset key
E	Pressing the clear key

Note: “Power OFF” denotes turning off the NC power and main power.

[4]: Cause of alarm

[5]: Action to be taken to eliminate the cause

2. Alarm diagnosis

A. Types of alarms

If an alarm occurs, the alarm number and the alarm message are given at the bottom left of the screen.

D674M0363E

B. Alarm message display area

If any abnormality is detected with the NC unit or the machine, occurrence of an alarm is displayed on the screen by the alarm number and the alarm message. The alarm is largely classified into two types - the alarm which causes the machine to stop and the alarm which permits the machine to continue operating.

Example:

613 IMPROPER G-CODE The alarm which causes the machine to stop.

401 ILLEGAL NUMBER INPUT The alarm which permits machine operation to continue.

As shown in the example above, the alarm which causes the machine to stop is displayed by the alarm message in red while the alarm which permits continuous machine operation is displayed by the alarm message in green.

3. ALARM screen

Displayed when the **ALARM** screen selection key is pressed.

If the **ALARM** screen is not displayed in the first pressing of the ALARM display selection key, press this key until the **ALARM** screen is displayed.

> ALARM > MAINTENANCE > KEY HISTORY
/ HOME_MODE / CONTINUOUS_MODE
2006-01-17 09:49:21
ALARM
No. Alarm Message ONo. N B Y M D HH MM SS
1 1 EMERGENCY STOP 3 2006 Jan 17 9 48 29
2 291 U AXIS ASYNCHRONOUS 2006 Jan 17 9 48 29
ALARM
HISTORY
PROGRAM ERRORS
1 EMERGENCY STOP

D609M0028E

On the **ALARM** screen, the information (alarm number and alarm message, etc.) of the current alarm is displayed. For details, refer to Subsection 2-6-15, “ALARM Screen” in the Operating Manual of the PREVIEW.

13-2 Alarm List

1. Messages and contents of alarms

A. No. 001 to No. 9999

No.	Message	Description
001	EMERGENCY STOP	The NC has been placed in the emergency stop state.
002	SYSTEM ERROR	An error is detected in the system.
003	PANEL CONNECT ERROR	An error is detected in communications between the NC unit and the operating panel.
004	+15V POWER FAIL	An error has occurred in the power supply.
005	–15V POWER FAIL	An error has occurred in the power supply.
009	FAILED TO OPEN PARAMETER FILE	The parameter file has not been found.
019	SAVING PARAMATER WAS FAILED	The system has failed to save the parameter file.
030	X AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
031	Y AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
032	Z AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
033	4 AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
036	X AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier.
037	Y AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier.
038	Z AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier.
039	4 AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier.
040	X DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
041	Y DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
042	Z DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
043	4 DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
044	X DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
045	Y DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
046	Z DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
047	4 DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
048	X MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
049	Y MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
050	Z MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
051	4 MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.

No.	Message	Description
052	X SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
053	Y SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
054	Z SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
055	4 SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
056	X OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
057	Y OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
058	Z OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
059	4 OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
060	X OVER LOAD 2	The motor has been operated exceeding its rated output.
061	Y OVER LOAD 2	The motor has been operated exceeding its rated output.
062	Z OVER LOAD 2	The motor has been operated exceeding its rated output.
063	4 OVER LOAD 2	The motor has been operated exceeding its rated output.
064	X AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
065	Y AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
066	Z AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
067	4 AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
068	X A/D ERROR	An error has occurred in the axis A/D converter.
069	Y A/D ERROR	An error has occurred in the axis A/D converter.
070	Z A/D ERROR	An error has occurred in the axis A/D converter.
071	4 A/D ERROR	An error has occurred in the axis A/D converter.
072	X INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
073	Y INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
074	Z INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
075	4 INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
076	X OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
077	Y OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
078	Z OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
079	4 OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
080	X MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
081	Y MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.

No.	Message	Description
082	Z MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
083	4 MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
084	X AXIS POWER MODULE MALFUNCTION	The power module of the X-axis servo amplifier has become abnormal.
085	Y AXIS POWER MODULE MALFUNCTION	The power module of the Y-axis servo amplifier has become abnormal.
086	Z AXIS POWER MODULE MALFUNCTION	The power module of the Z-axis servo amplifier has become abnormal.
087	4 AXIS POWER MODULE MALFUNCTION	The power module of the 4th axis servo amplifier has become abnormal.
088	X OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
089	Y OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
090	Z OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
091	4 OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
092	X DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
093	Y DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
094	Z DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
095	4 DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
096	X POWER FAIL	The supply voltage of the amplifier is too low.
097	Y POWER FAIL	The supply voltage of the amplifier is too low.
098	Z POWER FAIL	The supply voltage of the amplifier is too low.
099	4 POWER FAIL	The supply voltage of the amplifier is too low.
102	X+ OVERTRAVEL	The axis is in the hardware overtravel state.
103	X– OVERTRAVE	The axis is in the hardware overtravel state.
104	Y+ OVERTRAVEL	The axis is in the hardware overtravel state.
105	Y– OVERTRAVEL	The axis is in the hardware overtravel state.
106	Z+ OVERTRAVEL	The axis is in the hardware overtravel state.
107	Z– OVERTRAVEL	The axis is in the hardware overtravel state.
108	4+ OVERTRAVEL	The axis is in the hardware overtravel state.
109	4– OVERTRAVEL	The axis is in the hardware overtravel state.
110	X– SOFT OT	The axis is in the software overtravel state.
111	X+ SOFT OT	The axis is in the software overtravel state.
112	Y– SOFT OT	The axis is in the software overtravel state.
113	Y+ SOFT OT	The axis is in the software overtravel state.
114	Z– SOFT OT	The axis is in the software overtravel state.
115	Z+ SOFT OT	The axis is in the software overtravel state.
116	4– SOFT OT	The axis is in the software overtravel state
117	4+ SOFT OT	The axis is in the software overtravel state.
122	IMPROPER TRACER VOLTAGE	The profiling voltage is incorrect.
130	X AXIS SERVO IS ON	The servo is on.

No.	Message	Description
131	Y AXIS SERVO IS ON	The servo is on.
132	Z AXIS SERVO IS ON	The servo is on.
133	4 AXIS SERVO IS ON	The servo is on.
140	STARTING COND. ERR (MANUAL)	The cycle start button has been pressed in the manual operation mode.
141	STARTING COND. ERR (IN OPR.)	The cycle start button is pressed while the automatic operation is in progress.
143	MEMORY PROTECT	An all delete signal is input from the programmable controller while the program update signal is in the invalid state.
144	DATA I/O WORKING	An all delete signal is input from the programmable controller during data input/output processing.
145	MEMORY PROTECT (AUTO OPRAT.)	An “All delete” signal or a “Program number search” signal is input from the programmable controller during automatic operation.
146	NO DESIGNATED PROGRAM NUMBER	Although a program number search signal is input from the programmable controller, the designated program number is not found in the NC unit.
147	STARTING COND. ERR (ALARM)	The cycle start button has been pressed during an alarm.
148	STARTING COND. ERR (MODE CHG.)	The cycle start button has been pressed during a mode change.
149	STARTING COND. ERR (COMPILE)	The cycle start button has been pressed during compiling.
151	TOO SMALL SPEED	There is no F command specified for the G01, G02, or G03 mode.
152	PROGRAM COMMAND WILL CAUSE OT	An axis is going to enter the area defined by the G22 command.
153	NOT ZERO RETURNED AXIS EXIST	In the G30 block, an axis which has not been returned to the zero position is specified.
154	IMPROPRE CUTTING PLANE SELECT	In the circular interpolation command, an axis other than X and Y is specified.
158	NO ASSIST GAS PRS.DESIGNATION	In the G88 block, no gas pressure command (P command) is specified.
159	G27 ERROR	When the G27 command is executed, the present position in the machine coordinate system does not agree with the specified reference point position.
161	TOO SMALL SPEED	There is no F command specified for the G01, G02 or G03 mode.
162	PROGRAM COMMAND WILL CAUSE OT	An axis is going to enter the area defined by the G22 command.
163	NOT ZERO RETURNED AXIS EXIST	In the G30 command, an axis which has not been returned to the zero position is specified.
164	IMPROPRE CUTTING PLANE SELECT	In the circular interpolation command, an axis other than X and Y is specified.
168	NO ASSIST GAS PRS.DESIGNATION	In the G88 block, no gas pressure command (P command) is specified.
169	G27 ERROR	When the G27 command is executed, the present position in the machine coordinate system does not agree with the specified reference point position.
170	NEXT DISTANCE CAN NOT BE CAL.	Internal error of the NC unit; the calculation for the distance to be moved next during automatic operation is impossible.
174	NO SKIP INPUT	In the G31 block, the skip signal is not turned on before the completion of the axis movement command.
175	NO SKIP INPUT ERROR	In the G31 block, a skip signal other than skip signal 1 is turned on first.
176	ILLEGAL Z COMMAND	In M32 mode (profiling on), Z-axis is commanded though the profiling is on.
177	ILLEGAL Z COMMAND	[During tool path check] Z-axis is commanded during profiling on by M32 command.
200	SQ HARDWARE ERROR	An error is detected at the SQ processing section in the servo control board (SSI).
202	REMOTE I/O COMMUNICATION ERR	An error has occurred during remote I/O communications.
400	ILLEGAL FORMAT	The format of the data being set is illegal.
401	ILLEGAL NUMBER INPUT	The value being set is too large (small).
402	MEMORY PROTECT (AUTO OPRAT.)	An attempt was made to set the data which cannot be set during automatic operation.
403	TOOLPATH IS ON	An attempt was made to set the data which cannot be set during tool path drawing.

No.	Message	Description
404	MEMORY PROTECT (I/O BUSY)	An attempt was made to set the data which cannot be set during data communication.
405	MEMORY PROTECT	The write-protect function remains valid.
406	SAME PROGRAM APPOINT	The WNo. set for program copy operation in the program file screen has already been entered.
407	NO DESIGNATED PROGRAM	The WNo. set for program copy operation, etc. in the program file screen does not exist.
408	MEMORY CAPACITY EXCEED (PROG.)	The program storing area is full.
409	EIA/ISO PROGRAM ERROR	Syntax error is entered in EIA/ISO program.
410	MACRO PROGRAM ERROR	Syntax error is entered in user macroprogram.
411	CALCULATION OVERFLOW	The input value exceeds the allowable input range.
412	CUTTING CND.STORAGE AREA FULL	The cutting condition data storing area is full.
413	SAME PROGRAM APPOINT	In the program copy operation on the program file screen, the same WNo. as used for editing is set, or WNo. has overlapped in data I/O operation.
414	I/O MODE MUST BE SELECTED	The “Execute” menu function has been selected while data I/O mode is not set.
415	INITIALIZE PROGRAM MEMORY	The memory area for storing programs is not initialized or it has been destroyed.
416	PROGRAM OVER	The number of entered programs has reached the limit.
420	COPY LINE IS OVER	Too many lines are designated for copy operation.
421	AXIS IS MOVING	The origin setting is selected during the axis movement in manual operation mode.
424	IMPROPER G-CODE	The set G-code cannot be used.
427	NO SERVO DATA	There is no data for servo monitor display.
429	INTEGER VALUE OVERFLOW	In a cut mode program, the value set for an address where integer data should be set is too large.
430	REAL VALUE OVERFLOW	In a cut mode program, the value set for an address where real data should be set is too large.
431	FORMAT ERROR IN CALCULATION	Format for the operation in the program is illegal.
432	[ ] MISMATCH	Mismatch in the number of “[” and “]” in the program.
433	( ) MISMATCH	Mismatch in the number of “(” and “)” in the program.
434	DATA IS TO BE INPUT	Necessary data setting items are left blank for load/save operation.
442	MEMORY PROTECT (AUTO MODE)	The origin setting is performed in the automatic operation mode.
444	STARTING COND. ERR (MANUAL)	The cycle start button has been pressed in the manual operation mode.
531	ILLEGAL FORMAT	The O number of the program having been loaded is “0”.
532	LOAD IMPOSSIBLE (SIZE OVER)	An attempt was made to load a program exceeding the allowable memory capacity of the NC unit.
533	LOAD IMPOSSIBLE (TOO MANY)	An attempt was made to load programs exceeding the allowable number of programs.
534	LOAD IMPOSSIBLE (AUTO OPE.)	An attempt was made to load the program having the same O number as the one assigned to the program presently executed for automatic operation.
535	STOP POWER IN TAPE READER	NC power supply has been turned off during data communication with the tape reader/punch.
537	RS232C PARITY ERROR	Illegal parity is found in data communication.
538	RS232C OVERRUN ERROR	In data communication, the next character is sent while the character received previously was not read.
539	RS232C FRAMING ERROR	In data communication, stop bit has not been detected in the received characters.
541	CONTENTS ARE NOT COINCIDENT	The data in tape do not coincide with the data in the NC unit.
547	TAPE READER MIS-CONNECTED	The tape reader is not connected, or the tape reader is not in the ready state.
548	TAPE PUNCHER MIS-CONNECTED	The tape punch is not connected, or the tape punch is not in the ready state.

No.	Message	Description
551	MEMORY PROTECT	An attempt was made to load the program while the program protect switch is in the LOCK position.
552	PROG. OPERATION NO ALLOWED	An attempt was made to load the program having the same O number as the one assigned to the program presently edited.
553	NO DESIGNATED WORK No.	In program loading operation, program number is specified at neither the NC unit side nor the tape side.
555	PARITY H ERROR	The number of characters in a block is odd (even in the case of EIA-coded data).
556	PARITY V ERROR	When loading a program, the parity for one block was incorrect.
557	TAPE READER ERROR	An attempt was made to read the data or format which cannot be stored in the NC memory for a program.
558	SAME PROGRAM APPOINT	In the program load operation, an attempt was made to load the program number already existing in the NC memory.
559	NO DESIGNATED PROGRAM	In the program save operation, the designated program number does not exist in the NC memory.
570	NO DNC OPTION	An option parameter is designated although the option is not selected.
571	DNC TIME OVER	In DNC communications, no data is received within the specified period.
572	DNC BOARD ERROR	An error has occurred with the DNC board.
577	RS232C PARITY ERROR (DNC)	Parity error in I/O communications.
578	RS232C OVERRUN ERROR (DNC)	In I/O communications, while the received character is not read, the next character is received.
579	RS232C FRAMING ERROR (DNC)	In I/O communications, no stop bit is detected for the received character.
584	RECEIVED DATA NOT COINCIDENT	In DNC communications, the structure of the data received from the host CPU is different. (DC2 and DC4 are not detected.)
590	DNC COMMAND IMPOSSIBLE	The command is received from the host CPU with a false machine number.
591	REBOOT CNC TO ENABLE PARAMETERS	The parameters have been loaded.
592	RECEIVED ILLEGAL COMMAND	Incorrect command is received from the host CPU.
600	ILLEGAL FORMAT	The format in the program is incorrect.
601	ILLEGAL NUMBER INPUT	The numeric value set for an address is outside the allowable range.
602	SUB PROGRAM NESTING OVER	The nesting level in subprogram call has exceeded the allowable limit.
603	NO DESIGNATED PROGRAM	When starting program execution, the designated program is not found.
606	DESIGNATED SNo. NOT FOUND	In the return operation from a subprogram, or when executing the GOTO command, the designated sequence number is not found.
607	NO INTERSECTION	When executing the tool diameter offset (G41, G42), offset shape cannot be calculated (due to too large an offset value etc.).
609	EIA/ISO PROGRAM ERROR	Syntax errors are found in the entered EIA/ISO program.
610	NUMBER OF SAMPLING NOT ENOUGH	The profiling unit voltage requires sampling at a larger number of positions.
611	ILLEGAL AXIS NAME	The axis address names used in a program do not agree with the axis address names set in the parameters.
612	IMPROPER NC ADDRESS	An address which is not supported by the NC unit is used.
613	IMPROPER G-CODE	A G-code which is not supported by the NC unit is used.
614	NEGATIVE T COMMAND	A minus value has been designated in the T-code command.
615	NEGATIVE M COMMAND	A minus value has been designated in the M-code command.
619	TARGET NOT FOUND ARC	Any of the start point, end point or center of the arc is wrong.
620	CENTER NOT FOUND	When defining an arc using an R command, the center of the arc cannot be calculated.
625	G17-G19 COMMAND IN G68	A plane selection command (G17, G18, G19) is specified while in the G68 mode (coordinate rotation).

No.	Message	Description
626	G17-G19 COMMAND IN G38-G42	A plane selection command (G17, G18, G19) is specified while in the tool diameter offset mode (G41, G42).
636	G41,G42,FORMAT ERROR	A tool diameter offset command (G40, G41, G42) is specified while in the circular interpolation mode (G02, G03).
639	ILLEGAL OFFSET No.	In the tool diameter offset mode (G41, G42), the offset number is greater than the supported number of offset sets.
643	PROGRAM NO. NOT FOUND	When calling a subprogram, the specified subprogram is not found.
644	DUPLICATE SUB-CALL	More than two subprogram call commands (M98 or G65) are specified in a single block.
645	#ERROR	When executing a macro, the specified variable number is larger than the allowable variable number.
653	USERMACRO MIS-OPERATION	An NC statement and macro statement are specified in the same block.
654	TOO MANY MACRO NESTING	Nesting level for macro call has exceeded the limit.
655	USERMACRO ARGUMENT OVER	In the macro call, the number of arguments used has exceeded the allowable limit.
656	USERMACRO G67 MIS-OPERATION	The G67 command is specified while not in the G66 mode.
659	CALCULATE IMPOSSIBLE	Calculation expression format is incorrect.
660	ZERO DIVIDE ERROR	“0” is used in denominator.
661	INTEGER VALUE OVERFLOW	During the process of operation, an overflow occurred with integer (-2^{31} or $2^{31}-1$ is exceeded).
662	REAL VALUE OVERFLOW	An overflow is occurred with the data of macro variable.
663	‘IF’ ERROR	An error in “IF [condition] GOTO” statement.
664	‘WHILE’ ERROR	An error in “WHILE [condition] DO END” statement.
665	GOTO DESIGNATION IS IN DO-END	The branch destination specified by GOTO is in blocks of DO END statement.
666	WHILE NEST OVER	The number of “DO END” in the “WHILE [condition] DO END” statement has exceeded 27.
667	‘DO’ & ‘END’ MISMATCH	DO and END are not used in pairs.
668	N No. SEARCH	In sequence number search processing called by the GOTO state, etc., mismatch in DO and END is found.
686	ILLEGAL G10 L NUMBER	In the G10 command, an L number outside the allowable range is specified.
687	ILLEGAL G10 CORRECTION No.	In the G10 command, an offset number outside the allowable range is specified.
693	NO DIRECT. FOR NEXT MOVE R/C	The block following the corner R/C command does not include an axis movement command.
694	INSUFF. MOVE DISTANCE R/C	In the corner R/C command, axis movement distance is smaller than the corner R/C command.
695	INSUFF. NEXT MOVE DIST. R/C	In the corner R/C command, axis movement distance in the next block is smaller than the corner R/C command.
703	SKIP SPEED ZERO	In the G31 (skip) command, no feed rate F command is specified.
708	SKIP COMMAND DURING OFFSET	The G31 (skip) command is specified while in the tool diameter offset mode (G41, G42).
709	OFFSET INTERFERENCE	An interference error has occurred during the execution of the diameter offset command (G41, G42).
720	ILLEGAL BEAM OFFSET VALUE	The U-axis offset data is not correct.
800	ILLEGAL FORMAT	The format in the program is incorrect.
801	ILLEGAL NUMBER INPUT	The numeric value set for an address is outside the allowable range.
802	SUB PROGRAM NESTING OVER	The nesting level in subprogram call has exceeded the allowable limit.
803	NO DESIGNATED PROGRAM	When starting program execution, the designated program is not found.
806	DESIGNATED SNo. NOT FOUND	In the return operation from a subprogram, or when executing the GOTO command, the designated sequence number is not found.
807	NO INTERSECTION	When executing the tool diameter offset (G41, G42), offset shape cannot be calculated (due to too large an offset value etc.).

No.	Message	Description
809	EIA/ISO PROGRAM ERROR	Syntax errors are found in the entered EIA/ISO program.
811	ILLEGAL AXIS NAME	The axis address names used in a program do not agree with the axis address names set in the parameters.
812	IMPROPER NC ADDRESS	An address which is not supported by the NC unit is used.
813	IMPROPER G-CODE	A G-code which is not supported by the NC unit is used.
819	TARGET NOT FOUND ARC	Any of the start point, end point or center of the arc is wrong.
820	CENTER NOT FOUND	When defining an arc using an R command, the center of the arc cannot be calculated.
825	G17-G19 COMMAND IN G68	A plane selection command (G17, G18, G19) is specified while in the G68 mode (coordinate rotation).
826	G17-G19 COMMAND IN G38-G42	A plane selection command (G17, G18, G19) is specified while in the tool diameter offset mode (G41, G42).
836	G41,G42,FORMAT ERROR	A tool diameter offset command (G40, G41, G42) is specified while in the circular interpolation mode (G02, G03).
839	ILLEGAL OFFSET No.	In the tool diameter offset mode (G41, G42), the offset number is greater than the supported number offset sets.
843	PROGRAM NO. NOT FOUND	When calling a subprogram, the specified subprogram in not found.
844	DUPLICATE SUB-CALL	More than two subprogram call commands (M98 or G65) are specified in a single block.
845	#ERROR	When executing a macro, the specified variable number is larger than the allowable variable number.
853	USERMACRO MIS-OPERATION	An NC statement and macro statement are specified in the same block.
854	TOO MANY MACRO NESTING	Nesting level for macro call has exceeded the limit.
855	USERMACRO ARGUMENT OVER	In the macro call, the number of arguments used has exceeded that allowable limit.
856	USERMACRO G67 MIS-OPERATION	The G67 command is specified while not in the G66 mode.
859	CALCULATE IMPOSSIBLE	Calculation expression format is incorrect.
860	ZERO DIVIDE ERROR	“0” is used in denominator.
861	INTEGER VALUE OVERFLOW	During the process of operation, an overflow occurred with integer (-2^{31} or $2^{31}-1$ is exceeded).
862	REAL VALUE OVERFLOW	An overflow is occurred with the data of macro variable.
863	‘IF’ ERROR	An error is found in “IF [condition] GOTO” statement.
864	‘WHILE’ ERROR	An error is found in “WHILE [condition] DO END” statement.
865	GOTO DESIGNATION IS IN DO-END	The branch destination specified by GOTO is in blocks of DO-END statement.
866	WHILE NEST OVER	The number of “DO-END” in the “WHILE [condition] DO END” statement has exceeded 27.
867	‘DO’ & ‘END’ MISMATCH	DO and END are not used in pairs.
868	N No. SEARCH	In sequence number search processing called by the GOTO state, etc., mismatch in DO and END is found.
886	ILLEGAL G10 L NUMBER	In the G10 command, an L number outside the allowable range is specified.
887	ILLEGAL G10 CORRECTION No.	In the G10 command, an offset number outside the allowable range is specified.
893	NO DIRECT. FOR NEXT MOVE R/C	The block following the corner R/C command does not include an axis movement command.
894	INSUFF. MOVE DISTANCE R/C	In the corner R/C command, axis movement distance is smaller than the corner R/C command.
895	INSUFF. NEXT MOVE DIST. R/C	In the corner R/C command, axis movement distance in the next block is smaller than the corner R/C command.
903	SKIP SPEED ZERO	In the G31 (skip) command, no feedrate F command is specified.
908	SKIP COMMAND DURING OFFSET	The G31 (skip) command is specified while in the tool diameter offset mode (G41, G42).

No.	Message	Description
909	OFFSET INTERFERENCE	An interference error has occurred during the execution of the G41, G42 command.
1500	X AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1501	Y AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1502	Z AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1503	4 AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1504	5 AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1505	W AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1506	7 AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1507	8 AXIS ENCODER COMM. ERROR	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1508	X AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1509	Y AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1510	Z AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1511	4 AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1512	5 AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1513	W AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1514	7 AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1515	8 AXIS ENCODER BATTERY ERROR	The battery voltage has dropped.
1530	5 AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
1531	W AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
1532	7 AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
1533	8 AXIS SERVO Z SIGNAL ERROR	The Z-phase has not been detected during homing.
1536	5 AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier.
1537	W AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier.
1538	7 AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier
1539	8 AXIS SERVO SIGNAL ERROR 2	An error is detected in communications between the servo controller and the amplifier
1540	5 DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1541	W DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1542	7 DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1543	8 DETECTING NO SIGNAL	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1544	5 DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1545	W DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1546	7 DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.

No.	Message	Description
1547	8 DETECTING NO SIGNAL 2	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1548	5 MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1549	W MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1550	7 MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1551	8 MAGNETIC POS. DETECT MALF	An error has occurred during encoder signal transmission between the servomotor and the NC unit.
1552	5 SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
1553	W SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
1554	7 SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
1555	8 SERVO LAG EXCESS	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.
1556	5 OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
1557	W OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
1558	7 OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
1559	8 OVER LOAD	The motor is overloaded due to operation exceeding the motor's continuous rating or mechanical interference.
1560	5 OVER LOAD 2	The motor has been operated exceeding its rated output.
1561	W OVER LOAD 2	The motor has been operated exceeding its rated output.
1562	7 OVER LOAD 2	The motor has been operated exceeding its rated output.
1563	8 OVER LOAD 2	The motor has been operated exceeding its rated output.
1564	5 AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier
1565	W AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
1566	7 AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
1567	8 AXIS SERVO SIGNAL ERROR	An error is detected in communications between the servo controller and the amplifier.
1568	5 A/D ERROR	An error has occurred in the axis A/D converter.
1569	W A/D ERROR	An error has occurred in the axis A/D converter.
1570	7 A/D ERROR	An error has occurred in the axis A/D converter.
1571	8 A/D ERROR	An error has occurred in the axis A/D converter.
1572	5 INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
1573	W INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
1574	7 INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
1575	8 INVERTER CURRENT OVERLOAD	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.
1576	5 OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.

No.	Message	Description
1577	W OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
1578	7 OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
1579	8 OVER VOLTAGE	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.
1580	5 MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
1581	W MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
1582	7 MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
1583	8 MOTOR OVERHEAT	The motor has been overheated due to operation exceeding the motor's continuous rating.
1584	5 AXIS POWER MODULE MALFUNCTION	The power module of the 5th axis servo amplifier has become abnormal.
1585	W AXIS POWER MODULE MALFUNCTION	The power module of the W-axis servo amplifier has become abnormal.
1586	7 AXIS POWER MODULE MALFUNCTION	The power module of the 7th axis servo amplifier has become abnormal.
1587	8 AXIS POWER MODULE MALFUNCTION	The power module of the 8th axis servo amplifier has become abnormal.
1588	5 OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
1589	W OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
1590	7 OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
1591	8 OVER REGENERATION	Acceleration/deceleration has been repeated too often and a regenerative resistor has overheated.
1592	5 DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
1593	W DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
1594	7 DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
1595	8 DYNAMIC BRAKE MALFUNCTION	The dynamic brake has been operated although dynamic brake command is not given.
1596	5 POWER FAIL	The supply voltage of the amplifier is too low.
1597	W POWER FAIL	The supply voltage of the amplifier is too low.
1598	7 POWER FAIL	The supply voltage of the amplifier is too low.
1599	8 POWER FAIL	The supply voltage of the amplifier is too low.
1602	5+ OVERTRAVEL	The axis is in the hardware overtravel state.
1603	5– OVERTRAVEL	The axis is in the hardware overtravel state.
1604	W+ OVERTRAVEL	The axis is in the hardware overtravel state.
1605	W– OVERTRAVEL	The axis is in the hardware overtravel state.
1606	7+ OVERTRAVEL	The axis is in the hardware overtravel state.
1607	7– OVERTRAVEL	The axis is in the hardware overtravel state.
1608	8+ OVERTRAVEL	The axis is in the hardware overtravel state.
1609	8– OVERTRAVEL	The axis is in the hardware overtravel state.
1610	5– SOFT OT	The axis is in the software overtravel state.

No.	Message	Description
1611	5+ SOFT OT	The axis is in the software overtravel state.
1612	W– SOFT OT	The axis is in the software overtravel state.
1613	W+ SOFT OT	The axis is in the software overtravel state.
1614	7– SOFT OT	The axis is in the software overtravel state.
1615	7+ SOFT OT	The axis is in the software overtravel state.
1616	8– SOFT OT	The axis is in the software overtravel state.
1617	8+ SOFT OT	The axis is in the software overtravel state.
1630	5 AXIS SERVO IS ON	The servo is on.
1631	W AXIS SERVO IS ON	The servo is on.
1632	7 AXIS SERVO IS ON	The servo is on.
1633	8 AXIS SERVO IS ON	The servo is on.
2000	Abnormal CPU status (Vcore)	A normal supply voltage is not supplied to the main board.
2001	Abnormal CPU status (Vtt)	A normal supply voltage is not supplied to the main board.
2002	Abnormal CPU status (+1.8V)	A normal supply voltage is not supplied to the main board.
2003	Abnormal CPU status (+3.3V)	A normal supply voltage is not supplied to the main board.
2004	Abnormal CPU status (+5V)	A normal supply voltage is not supplied to the main board.
2005	Abnormal CPU status (–5V)	A normal supply voltage is not supplied to the main board.
2006	Abnormal CPU status (+12V)	A normal supply voltage is not supplied to the main board.
2007	Abnormal CPU status (–12V)	A normal supply voltage is not supplied to the main board.
2008	Abnormal CPU status (+3.3Vsb)	A normal supply voltage is not supplied to the main board.
2009	Abnormal CPU status (Vbat)	A normal supply voltage is not supplied to the main board.
2010	Abnormal CPU status (CPU fan)	Either a normal supply voltage is not supplied to the CPU-cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the CPU-cooling fan is causing an unusual fan speed.
2011	Abnormal CPU status (PSU/CHASSIS fan)	Either a normal supply voltage is not supplied to the PSU (Power Supply Unit) cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the PSU-cooling fan is causing an unusual fan speed.
2012	Abnormal CPU status (CPU temp)	An unusual CPU temperature has been detected on the main board.
2013	Abnormal CPU status (PSU/CHASSIS temp)	An unusual PSU/chassis temperature has been detected on the main board.
2020	Abnormal CPU status (Vcore)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2021	Abnormal CPU status (Vtt)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2022	Abnormal CPU status (+1.8V)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2023	Abnormal CPU status (+3.3V)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2024	Abnormal CPU status (+5V)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2025	Abnormal CPU status (–5V)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2026	Abnormal CPU status (+12V)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2027	Abnormal CPU status (–12V)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2028	Abnormal CPU status (+3.3Vsb)	A normal supply voltage is not supplied to the main board (the current situation is not serious).
2029	Abnormal CPU status (Vbat)	A normal supply voltage is not supplied to the main board (the current situation is not serious).

No.	Message	Description
2030	Abnormal CPU status (CPU fan)	Either a normal supply voltage is not supplied to the CPU-cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the CPU-cooling fan is causing an unusual fan speed (the current situation is not serious).
2031	Abnormal CPU status (PSU/CHASSIS fan)	Either a normal supply voltage is not supplied to the PSU (Power Supply Unit) cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the PSU-cooling fan is causing an unusual fan speed (the current situation is not serious).
2032	Abnormal CPU status (CPU temp)	An unusual CPU temperature has been detected on the main board (the current situation is not serious).
2033	Abnormal CPU status (PSU/CHASSIS temp)	An unusual PSU/chassis temperature has been detected on the main board (the current situation is not serious).
2040	Turning off by abnormal CPU status (Vcore)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2041	Turning off by abnormal CPU status (Vtt)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2042	Turning off by abnormal CPU status (+1.8V)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2043	Turning off by abnormal CPU status (+3.3V)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2044	Turning off by abnormal CPU status (+5V)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2045	Turning off by abnormal CPU status (–5V)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2046	Turning off by abnormal CPU status (+12V)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2047	Turning off by abnormal CPU status (–12V)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2048	Turning off by abnormal CPU status (+3.3Vsb)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2049	Turning off by abnormal CPU status (Vbat)	A normal supply voltage is not supplied to the main board (the current situation is serious).
2050	Turning off by abnormal CPU status (CPU fan)	Either a normal supply voltage is not supplied to the CPU-cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the CPU-cooling fan is causing an unusual fan speed (the current situation is serious).
2051	Turning off by abnormal CPU status (PSU/CHASSIS fan)	Either a normal supply voltage is not supplied to the PSU (Power Supply Unit) cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the PSU-cooling fan is causing an unusual fan speed (the current situation is serious).
2052	Turning off by abnormal CPU status (CPU temp)	An unusual CPU temperature has been detected on the main board (the current situation is serious).
2053	Turning off by abnormal CPU status (PSU/CHASSIS temp)	An unusual PSU/chassis temperature has been detected on the main board (the current situation is serious).
9000	INTERNAL ALARM	An unexpected alarm has occurred.
9010	INTERNAL WARNING	An unexpected warning has occurred.

B. No. 100000 to 407000

No.	Message	Description
104017	Arguments after M98 are ineffective. Use G65.	M98 with arguments is ineffective. Use G65.
220107	Please insert M31 before M30	M30 has been assigned during profiling.
220108	Please insert M31 before G28/G30	Executing the homing command has been attempted during profiling.
220109	Please insert M31 before G53	Executing the machine coordinate command has been attempted during profiling.
220116	restart block not found	The block specified as the restart positon does not exist.
300999	ILLEGAL INTERRUPT in IP !	An invalid interrupt has been entered into the CPU.
301100	Save condition again (Updated cutting condition file)	The format of the machining conditions has been updated.
301401	CTQ data is not correct, out of range	Data of the CTQ file is not correct.
301402	CTQ data (combo) is not correct, out of range	Data of the CTQ file is not correct.
301500	Tool Data is not correct	The tool registration is wrong.
301501	ATC is running, can not change now	The system is now executing ATC. Tool data cannot be changed.
301510	Setting tool No is not correct, please set again	The setting method for the current tool number is wrong. Set the tool number properly.
301550	G22 Command Error	The T, Z, or W command is incorrect.
301551	Tool not found	The T command is incorrect.
301552	Nozzle not found	The Z command is incorrect.
301600	CCD adjust error	The nozzle data is incorrect.
301601	CCD out of position	The execution position of the CCD function is wrong.
301602	Nozzle is outside of CCD spec.	The CCD function cannot be used for the nozzle.
301601	CCD out of position	CCD is designated in an incorrect position.
302051	can not update program monitor	The program monitor cannot be updated properly. A system error is occurring.
302052	not correct mode	Invalid mode has been selected. A system error is occurring.
302053	not mdi mode	The system is not in MDI mode. A system error is occurring.
302061	preview not ready	The system is not ready for file updating.
302071	mdi text size over	Text of the MDI command is in excess of capacity.
302072	mdi text error	The MDI program is not correct.
302101	Could not open CTQ file	The CTQ file has not been found.
302102	No cutting condition file	The machining conditions selected in the program do not exist.
302130	Not project file	The file is not a project file. The machining conditions cannot be edited.
302131	common ctq file is no selection	No CTQ file is selected.
302140	No Input, material or thickness	The type or plate thickness of material is not entered.
302141	Cutting condition is already exist	The CTQ file already exists.
302201	The selected file is not a ctq file	The selected file is not a CTQ file.
302301	The selected file is not a < *.cnc > file	The selected file is not a CNC file.
302503	file system memory error	An error has occurred in the file system memory.
302504	file system error	An error has occurred in the file system.
302505	file size error	The file size is too large.
302506	file dir name is too long	The folder name is in excess of the specified length.
302507	file name is too long	The file name is in excess of the specified length.
302508	Could not change file owner	The system has failed to change the owner of the file.
302509	Could not change file mode	The system has failed to change the mode of the file.
302511	Could not open markerfile	The designated marker file has not been found.

No.	Message	Description
302512	Marker file empty	Data is missing in the designated marker file.
302515	Could not read ctqfile data	The CTQ file cannot be read.
302516	Could not open ctqfile	The CTQ file has not been found.
302517	No cutting condition file	The machining conditions selected in the program do not exist.
302521	Could not open eiafile	The EIA file does not exist.
302522	Eia file empty	Data is missing in the EIA file.
302525	Could not read file data	The file cannot be read.
302526	Could not copy file data	The file cannot be copied.
302527	Could not read merge eia file data	The file with the combined subprogram cannot be read.
302530	Preview failed, program syntax error	The system has failed to conduct the preview. The program contains errors.
302531	Could not load program now	The program cannot be loaded into the CNC memory.
302532	Could not update foreground program	The system has failed to update the foreground program.
302534	Could not load dnc program	The DNC program cannot be loaded into the CNC memory.
302535	Could not copy dnc program	The DNC program cannot be copied from the primary folder into the secondary folder.
302536	DNC program file does not exist	The DNC program file does not exist in the primary folder.
302537	Marker program file does not exist	Although the DNC program is an intelligent program, a marker file is missing in the program.
302538	EIA program file does not exist	Although the DNC program is an EIA program, an EIA file is missing in the program.
302539	Project data file does not exist	Although the DNC program is an intelligent program, an attribute file is missing in the program.
302541	Could not open directory	The designated folder does not exist.
302542	file does not exist	The designated file does not exist.
302543	Project files do not exist	A project does not exist in the designated folder.
302544	few files exist	Multiple files exist in the DNC primary folder.
302545	few project exist	Multiple projects exist in the DNC primary folder.
302546	Could not delete files	The system has failed to delete the file(s) from the DNC primary folder.
302547	Could not make project files	The MSS file cannot be decompressed.
302551	Could not open project data file	The project file does not exist.
302552	Project data file empty	The project file does not contain data.
302561	Could not read project data file	The project file cannot be read.
302562	Could not update ctq data	The system has failed to update the CTQ file during project reading.
302571	Could not merge sub program	The system has failed to combine the subprogram.
302572	Sub program file name size over max:8	The number of characters in the subprogram namd is greater than the specified size.
302581	This is foreground program	The program is executed in automatic operation mode. The program cannot be renamed or deleted.
302582	Program file is not selected	A program is not selected.
302583	Program size over	The program size is too large.
302584	Program line over	The number of lines in the program is too large.
302586	Now compiling file!!!	The system is now compiling a program.
302587	Now loading file!!!	The system is now loading a program.
302600	could not open directory	The designated folder does not exist.
302601	could not open project directory	The folder of the designated project has not been found.
302602	could not open eia directory	The folder of the designated EIA file has not been found.
302605	could not make directory	The folder cannot be created.
302611	Could not open marker file	The designated marker file cannot be read.

No.	Message	Description
302612	Marker file empty	Data is missing in the designated marker file.
302615	Marker program already exists	The marker file already exists.
302621	Could not open eia file	The designated EIA file cannot be read.
302622	Eia file empty	Data is missing in the designated EIA file.
302625	Eia program already exists	The EIA file already exists.
302631	Could not open project file	The designated project cannot be read.
302632	Project file empty	Data is missing in the designated project.
302641	Ctq file is missing	The designated CTQ file does not exist.
302651	Could not write project file data	The project attribute file cannot be updated.
302662	Same file already exists	The file name already exists.
302663	not correct mode	The designated NC mode is invalid.
303401	Toolpath display buffer full	Drawing has been aborted because the maximum number of tool path blocks which can be displayed has been exceeded.
303402	Toolpath for one pallet displayed	Only the machining path for the first pallet has been displayed and drawing aborted.
303403	Interference	The tool path existing after the diameter offset has been conducted is interfering.
307011	Could not open Marker file	The designated marker file cannot be read.
307012	Marker file empty	Data is missing in the designated marker file.
308000	could not find current technique	The current CTQ file is missing.
308121	No Calculation Tang (U Signal)	The system has failed to detect the rising edge of the U-phase signal during torque angle calculation.
308122	No Calculation Tang (Z Signal)	The system has failed to detect the rising edge of the Z-phase signal during torque angle calculation.
308311	Could not open markerfile	The designated marker file cannot be read.
308312	Marker file empty	Data is missing in the designated marker file.
308500	Update program has failed	The program monitor cannot be updated properly. A system error is occurring.
308502	restart block not found	The block designated as restart position does not exist.
308550	Now analyzing password	The password was entered again when the NC unit was executing password analysis.
308560	Parameter was damaged. please restore	Power has been turned off during file writing onto the hard disk by the NC software or the OS, so the file has been damaged.
308561	Backup parameter copy failed. it is HD exchange	The backup area is damaged.
308700	beam offset out of synchronous area	The U-axis is not present in its synchronizing area.
309000	To merge sub program is failed.	Subprogram combining has failed.
309001	Sub program file is not found.	The designated subprogram does not exist.
309002	Could not save complete text file (CNCpro.cnc).	The file with the combined subprogram cannot be saved.
309003	Sub program file number is different from O number in text.	The O number of the subprogram is wrong.
309100	userpasswd file write failed.	The system has failed to save data in the file corresponding to the entered password.
309101	userpasswd file read failed.	The system has failed to read out the file corresponding to the entered password.
309102	Authentication of current password failed.	The system has failed to authenticate the current password.
309103	Authentication of new password failed.	The system has failed to authenticate the new password.
309104	Password have to be less than 20 characters.	The number of characters in the password is in excess of 20 characters.

No.	Message	Description
309105	Input current password.	Enter the current password.
309106	Input new password.	Enter a new password.
309150	Backup failure.	Parameter saving in the backup area has failed.
309200	During auto processing	Parameter loading has been attempted during automatic operation.
310020	Could not read macro valiable (#800-#812)	During NC start, the system has failed to load the macro variables saved in the storage area.
310500	Updating mode	The system is in version-upgrading mode.
310501	File is not selected.	A file is not selected.
310503	File name is invalid.	The file name is not correct.
310504	File is invalid.	The file contents are not correct.
310505	File is not selected.	A file is not selected.
310506	Module is not selected.	A module is not selected.
310507	Selected file is mismatch.	The selected file does not match the CPU in which the version is going to be upgraded.
310508	Flash memory writing program is invalid	The [SH2_UMOD.MOT] file cannot be unfolded.
310509	Software file is invalid.	The selected file cannot be unfolded.
310510	Failed to create temporary data file.	An error has occurred during the creation of the temporary file.
310511	Failed to transmit data.	An error has occurred during data transfer.
310512	Compare error.	An error has occurred during comparison.
310513	Can not open [SH2_UMOD.MOT] file.	The [SH2_UMOD.MOT] file cannot be opened.
310514	Can not open selected file.	The selected file cannot be opened.
310515	Failed to create SeqSwitch file.	The system has failed to create a sequencer switch file.
310516	Failed to connect USB memory.	Connection to the USB memory has failed.
310517	Turn off resonator and press EMG button before updating	Enter an emergency stop command to change the mode to version upgrading.
311001	Could not open markerfile	The designated marker file cannot be read.
311002	Marker file empty	Data is missing in the designated marker file.
311011	Could not open eiafile	The designated EIA file cannot be read.
311012	Eia file empty	Data is missing in the designated EIA file.
311020	Could not read ctq data	The system has failed to read CTQ properly during marker program conversion.
311030	Could not read text buffer correctory	The system has failed to properly read the program being edited.
311040	Marker program is not correct format.	The marker program contains syntax errors.
311041	Template marker code is not correct format.	The marker program contains template errors.
311042	Marker code headder is not correct format.	The header of the marker program is wrong.
311043	Ctq file is not correct format.	The system has failed to convert the CTQ code(s) properly.
311050	Marker sub program failed	The marker subprogram cannot be read properly.
311101	Could not open markerfile	The designated marker file cannot be read.
311102	Marker file empty	Data is missing in the designated marker file.
311106	Could not open marker sub file	The designated marker subfile cannot be read.
311107	Mmarker sub file empty	Data is missing in the designated marker subfile.
311111	Could not open eiafile.	The designated EIA file cannot be read.
311112	Eia file empty	Data is missing in the designated EIA file.
311116	Could not read new file data, can not edit	The new program cannot be read using the editor.
311117	Could not read select file data, can not edit	The selected program cannot be read using the editor.

No.	Message	Description
311118	Could not read current file data, can not edit	The current program cannot be read using the editor.
311120	memory allocation error	The system has failed to reserve the necessary memory location.
311121	file system error	An error has occurred in the file system.
311122	Could not make system directory	The system has failed to create the system folder.
311130	Could not find EOR code.	An end-of-file code is missing.
311131	Could not find M30 code.	An end-of-program code is missing.
311160	Program file is protected	The program is write-protected.
311200	Marker codes program is not correct format.	The marker program contains syntax errors.
311211	To update ctq file is failed	The system has failed to update CTQ.
311230	No text in marker program	The required data is missing in the marker program.
311231	Marker code program syntax error	The marker program contains syntax errors.
311241	Can not edit foreground during running	Currently in automatic operation. The program cannot be edited.
311242	Can not preview during running	Currently in automatic operation. PREVIEW cannot be executed.
311243	Can not edit foregorund in MDI mode	Currently in MDI mode. The foreground program cannot be edited.
311250	Could not save program correctory	The program cannot be saved.
311251	Could not write program to file	The program cannot be written into the file.
311252	Saving program	The system is now saving the program.
311261	Could not open complete markerfile	The marker file with the combined subprogram cannot be read.
311262	Complete marker file empty	Data is missing in the marker file with the combined subprogram.
311300	marker program codes syntax error	The marker program contains syntax errors.
311400	Marker code block syntax error	The marker code block contains syntax errors.
311401	No flag in a marker block	The flag value of the marker code is not correct.
311410	ATC flag conversion is failed	The ATC marker code is not correct.
311411	Lens sellection is not correct in ctq.	A torch is not properly selected for the machining conditions.
311412	Nozzle sellection is not correct in ctq.	A nozzle is not properly selected for the machining conditions.
311413	Start flag conversion is failed	The starting marker code is not correct.
311414	End flag conversion is failed	The ending marker code is not correct.
311415	Position flag conversion is failed	The position marker flag is not correct.
311420	Torch you selected is not in station	The designated torch is missing in the tool data.
311421	Nozzle you selected is not in station	The designated nozzle is missing in the tool data.
311422	No piercing condition of tool you selected	The piercing conditions for the designated tool are not contained in machining condition data.
311423	No cutting condition of tool you selected	The cutting conditions for the designated tool are not contained in machining condition data.
311430	Piercing type is out of range	The piercing type marker is out of range.
311431	Cutting type is out of range	The cutting type marker is out of range.
311432	Cutting end type is out of range	The end-of-cutting type marker is out of range.
311433	Quality type is out of range	The quality marker is out of range.
311434	Speed is out of range	The speed marker is out of range.
311461	Marker sub program file is not found.	A marker subprogram file is missing.
316000	Time to maintenance has already passed.	The preset time for maintenance has passed.
316001	Time to maintenance has already passed.	The preset time for maintenance has passed.
316002	Time to maintenance has come.	The preset time for maintenance has come.
316003	Time to maintenance has come.	The preset time for maintenance has come.

No.	Message	Description
316004	Time to maintenance will come soon.	The preset time for maintenance is coming soon.
316010	Check maintenance information.	Confirm maintenance information.
320000	Failed to make DNC directory	The system has failed to create the DNC directory.
320001	Failed to open COM port	Failed to connect to the DNC communication port.
320002	Invalid communication parameter	The DNC communication parameter is invalid.
320003	Failed to send program	Failed to send the DNC program.
320004	Program translation time over	Failed to transfer the DNC program because of a timeout.
320005	Failed to save program	Failed to save the DNC program.
320090	DNC WNo search error (1)	Program selection during DNC has failed.
320091	DNC WNo search error (2)	Program selection during DNC has failed.
320092	DNC WNo search error (1)	Program selection during DNC has failed.
320093	DNC WNo search error (2)	Program selection during DNC has failed.
400400	Gap Command Error	The override gap during the execution of the M32 command (Profiling ON) is too large.
401210	Trace Voltage Error (No Materials)	The Z-axis has stopped before a material was detected in the M32 command (Profiling ON) mode.
402171	Servo version is mismatch	The combination of the servo and main version numbers is incorrect.
402180	Axis is Moving	Axis movement is in progress.
402181	Reboot CNC to enable modified parameters.	Changes have been performed on the parameters that become effective after power-on.
405203	Sequencer version is mismatch	The combination of the programmable controller's and main version numbers is incorrect.
406100	DNC communication time over	Data has not been received within the designated DNC communications time.
406101	E-TOWER communication time over	Data has not been received within the designated E-TOWER communications time.
407000	Laser clamp was exceeded	The laser output is in excess of the laser-clamping value.

Eliminate the cause of the alarm referring to the resetting method below.
Be sure to press the reset key on the operating panel after eliminating the cause of errors. When the message disappears from the screen, the cause has been eliminated. When the message remains on the screen, eliminate the cause while referring to the resetting method.

2. Cause and remedy of alarms

A. No. 001 to No. 9999

No.	Message	Resetting method
001	EMERGENCY STOP (, ,)	B
Cause	The NC has been placed in the emergency stop state.	
Action	If this alarm has occurred following a press of the emergency stop button, release the emergency stop button and then press the OT release key and the reset key together. In the event of concurrence with a servo alarm, if this alarm cannot be cleared by pressing the OT release key and the reset key together, turn off the main power and then turn it back on.	
002	SYSTEM ERROR (, ,)	A
Cause	An error is detected in the system. (During NC software version upgrading, this message is always displayed, which is normal.)	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
003	PANEL CONNECT ERROR (, ,)	A
Cause	An error is detected in communications between the NC unit and the operating panel.	
Action	This alarm implies trouble with the cable or connector that connects the NC unit and the operating panel. Contact Mazak Technical Center or Technology Center.	
004	+15V POWER FAIL (, ,)	A
Cause	An error has occurred in the power supply.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
005	–15V POWER FAIL (, ,)	A
Cause	An error has occurred in the power supply.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
009	FAILED TO OPEN PARAMETER FILE (, ,)	E
Cause	The parameter file has not been found.	
Action	Confirm whether the parameter file is present in the USB memory.	
019	SAVING PARAMATER WAS FAILED (, ,)	E
Cause	The system has failed to recognize the saving destination for the parameter file.	
Action	Make sure that the USB memory has been successfully recognized. If the USB memory has not been recognized, disconnect and reconnect the USB memory.	
030 031 032 033	X AXIS SERVO Z SIGNAL ERROR Y AXIS SERVO Z SIGNAL ERROR Z AXIS SERVO Z SIGNAL ERROR 4 AXIS SERVO Z SIGNAL ERROR (, ,)	A
Cause	The encoder signal (Z-phase) has not been detected during axis movement or homing after power-on.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
036 037 038 039	X AXIS SERVO SIGNAL ERROR 2 Y AXIS SERVO SIGNAL ERROR 2 Z AXIS SERVO SIGNAL ERROR 2 4 AXIS SERVO SIGNAL ERROR 2 (, ,)	A
Cause	An error is detected in communications between the servo controller and the amplifier.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
040 041 042 043	X DETECTING NO SIGNAL Y DETECTING NO SIGNAL Z DETECTING NO SIGNAL 4 DETECTING NO SIGNAL (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	The encoder is likely to be malfunctioning. Contact Mazak Technical Center or Technology Center.	
044 045 046 047	X DETECTING NO SIGNAL 2 Y DETECTING NO SIGNAL 2 Z DETECTING NO SIGNAL 2 4 DETECTING NO SIGNAL 2 (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	The encoder is likely to be malfunctioning. Contact Mazak Technical Center or Technology Center.	
048 049 050 051	X MAGNETIC POS. DETECT MALF Y MAGNETIC POS. DETECT MALF Z MAGNETIC POS. DETECT MALF 4 MAGNETIC POS. DETECT MALF (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	The encoder is likely to be malfunctioning. Contact Mazak Technical Center or Technology Center.	
052 053 054 055	X SERVO LAG EXCESS Y SERVO LAG EXCESS Z SERVO LAG EXCESS 4 SERVO LAG EXCESS (, ,)	A
Cause	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
056 057 058 059	X OVER LOAD Y OVER LOAD Z OVER LOAD 4 OVER LOAD (, ,)	B
Cause	The motor is overloaded due to operation exceeding the motor's continuous rating and mechanical interference.	
Action	If the situation cannot be remedied by reducing the load, please contact Mazak Technical Center or Technology Center.	
060 061 062 063	X OVER LOAD 2 Y OVER LOAD 2 Z OVER LOAD 2 4 OVER LOAD 2 (, ,)	B
Cause	The motor has been operated exceeding its rated output.	
Action	If the situation cannot be remedied by reducing the load, please contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
064 065 066 067	X AXIS SERVO SIGNAL ERROR Y AXIS SERVO SIGNAL ERROR Z AXIS SERVO SIGNAL ERROR 4 AXIS SERVO SIGNAL ERROR (, ,)	A
Cause	An error is detected in communications between the servo controller and the amplifier.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
068 069 070 071	X A/D ERROR Y A/D ERROR Z A/D ERROR 4 A/D ERROR (, ,)	A
Cause	An error has occurred in the axis A/D converter.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
072 073 074 075	X INVERTER CURRENT OVERLOAD Y INVERTER CURRENT OVERLOAD Z INVERTER CURRENT OVERLOAD 4 INVERTER CURRENT OVERLOAD (, ,)	A
Cause	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.	
Action	Be sure to turn off the main power before troubleshooting. Check the motor power line for short circuits such as a ground fault, and if any short circuits are detected, remove the causes. If the alarm is not cleared even so, please contact Mazak Technical Center or Technology Center	
076 077 078 079	X OVER VOLTAGE Y OVER VOLTAGE Z OVER VOLTAGE 4 OVER VOLTAGE (, ,)	A
Cause	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
080 081 082 083	X MOTOR OVERHEAT Y MOTOR OVERHEAT Z MOTOR OVERHEAT 4 MOTOR OVERHEAT (, ,)	B
Cause	The motor has been overheated due to operation exceeding the motor's continuous rating.	
Action	Turn main power off and then turn it back on. Reduce the frequency of acceleration/deceleration to prevent overheating.	
084 085 086 087	X AXIS POWER MODULE MALFUNCTION Y AXIS POWER MODULE MALFUNCTION Z AXIS POWER MODULE MALFUNCTION 4 AXIS POWER MODULE MALFUNCTION (, ,)	A
Cause	The servo amplifier circuit protector has operated.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
088 089 090 091	X OVER REGENERATION Y OVER REGENERATION Z OVER REGENERATION 4 OVER REGENERATION (, ,)	B
Cause	Acceleration/deceleration has been repeated too often.	
Action	Turn main power off and then turn it back on. Reduce the frequency of acceleration/deceleration to prevent overheating.	

No.	Message	Resetting method
092 093 094 095	X DYNAMIC BRAKE MALFUNCTION Y DYNAMIC BRAKE MALFUNCTION Z DYNAMIC BRAKE MALFUNCTION 4 DYNAMIC BRAKE MALFUNCTION (, ,)	A
Cause	The dynamic brake has been operated although dynamic brake command is not given.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
096 097 098 099	X POWER FAIL Y POWER FAIL Z POWER FAIL 4 POWER FAIL (, ,)	A
Cause	The supply voltage of the amplifier is too low.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
102	X+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
103	X– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
104	Y+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
105	Y– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
106	Z+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	

No.	Message	Resetting method
107	Z– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
108	4+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
109	4– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
110	X– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
111	X+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
112	Y– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
113	Y+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
114	Z– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	

No.	Message	Resetting method
115	Z+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
116	4– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
117	4+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
122	IMPROPER TRACER VOLTAGE (, ,)	D
Cause	The profiling voltage is incorrect.	
Action	Execute automatic adjustment of profiling. If the same alarm is redisplayed, please contact Mazak Technical Center or Technology Center.	
130 131 132 133	X AXIS SERVO IS ON Y AXIS SERVO IS ON Z AXIS SERVO IS ON 4 AXIS SERVO IS ON (, ,)	C
Cause	Servo parameter changing has been attempted with the servo on.	
Action	Enter an emergency stop command to change a servo parameter. After the servo parameter change, turn power back on.	
140	STARTING COND. ERR (MANUAL) (, ,)	E
Cause	The cycle start button has been pressed in the manual operation mode.	
Action	Automatic operation cannot be started in manual mode.	
141	STARTING COND. ERR (IN OPR.) (, ,)	E
Cause	The cycle start button is pressed while the automatic operation is in progress.	
Action	Automatic operation is already started.	
143	MEMORY PROTECT (, ,)	E
Cause	An all delete signal is input from the programmable controller while the program update signal is in the invalid state.	
Action	Make the program update signal of the programmable controller valid.	
144	DATA I/O WORKING (, ,)	E
Cause	An all delete signal is input from the programmable controller during data input/output processing.	
Action	The all-delete function is invalid during data input/output processing.	

No.	Message	Resetting method
145	MEMORY PROTECT (AUTO OPRAT.) (, ,)	E
Cause	An “All delete” signal or a “Program number search” signal is input from the programmable controller during automatic operation.	
Action	The all-delete function or the program number search is invalid during automatic operation.	
146	NO DESIGNATED PROGRAM NUMBER (, ,)	E
Cause	Although a program number search signal is input from the programmable controller, the designated program number is not found in the NC unit.	
Action	The host command is wrong.	
147	STARTING COND. ERR (ALARM) (, ,)	E
Cause	The cycle start button has been pressed during an alarm.	
Action	Automatic operation cannot be started when an alarm is occurring.	
148	STARTING COND. ERR (MODE CHG.) (, ,)	E
Cause	The cycle start button has been pressed during a mode change.	
Action	Automatic operation cannot be started during a mode change.	
149	STARTING COND. ERR (COMPILE) (, ,)	E
Cause	The cycle start button has been pressed during compiling.	
Action	Automatic operation cannot be started during compiling.	
151	TOO SMALL SPEED (, ,)	D
Cause	There is no F command specified for the G01, G02, or G03 mode.	
Action	Enter an F command.	
152	PROGRAM COMMAND WILL CAUSE OT (, ,)	D
Cause	An axis is going to enter the area defined by the G22 command.	
Action	Change the program path.	
153	NOT ZERO RETURNED AXIS EXIST (, ,)	D
Cause	In the G30 block, an axis which has not been returned to the zero position is specified.	
Action	Either execute homing in manual mode or insert G28 (Return to Reference Position) in front of the G30 command code.	
154	IMPROPRE CUTTING PLANE SELECT (, ,)	D
Cause	In the circular interpolation command, an axis other than X and Y is specified.	
Action	Correct the program data to XY plane command data (G02X_Y_I_J_).	
158	NO ASSIST GAS PRS.DESIGNATION (, ,)	D
Cause	In the G88 block, no gas pressure command (P command) is specified.	
Action	Specify G88P_ in the program.	

No.	Message	Resetting method
159	G27 ERROR (, ,)	D
Cause	When the G27 command is executed, the present position in the machine coordinate system does not agree with the specified reference point position.	
Action	Correct the program so that the position of X, Y, Z to be specified in G27 matches to the reference position of the axis.	
161	TOO SMALL SPEED (, ,)	E
Cause	[During tool path check] There is no F command specified for the G01, G02 or G03 mode.	
Action	Enter an F command.	
162	PROGRAM COMMAND WILL CAUSE OT (, ,)	E
Cause	[During tool path check] An axis is going to enter the area defined by the G22 command.	
Action	Change the program path.	
163	NOT ZERO RETURNED AXIS EXIST (, ,)	E
Cause	[During tool path check] In the G30 command, an axis which has not been returned to the zero position is specified.	
Action	Either execute homing in manual mode or insert G28 (Return to Reference Position) in front of the G30 command code.	
164	IMPROPRE CUTTING PLANE SELECT (, ,)	E
Cause	[During tool path check] In the circular interpolation command, an axis other than X and Y is specified.	
Action	Correct the program data to XY plane command data (G02X_Y_I_J_).	
168	NO ASSIST GAS PRS.DESIGNATION (, ,)	E
Cause	[During tool path check] In the G88 block, no gas pressure command (P command) is specified.	
Action	Specify G88P_ in the program.	
169	G27 ERROR (, ,)	E
Cause	[During tool path check] When the G27 command is executed, the present position in the machine coordinate system does not agree with the specified reference point position.	
Action	Correct the program so that the position of X, Y, Z to be specified in G27 matches to the reference position of the axis.	
170	NEXT DISTANCE CAN NOT BE CAL. (, ,)	E
Cause	Internal error of the NC unit; the calculation for the distance to be moved next during automatic operation is impossible.	
Action	This message relates to a problem associated with creation of display data, and has no direct effects on machining. If the message is displayed frequently, however, please contact Mazak Technical Center or Technology Center.	
174	NO SKIP INPUT (, ,)	D
Cause	In the G31 block, the skip signal is not turned on before the completion of the axis movement command.	
Action	There has been no sensor input recognized as a skipping signal. The proper sensor may not be in contact with the worksheet. Perform program modifications for contact. If this alarm occurs in spite of the sensor being in contact, the sensor itself is likely to be abnormal.	

No.	Message	Resetting method
175	NO SKIP INPUT ERROR (, ,)	E
Cause	In the G31 block, a skip signal other than skip signal 1 is turned on first.	
Action	The skip signal input wiring is likely to be wrong. Contact Mazak Technical Center or Technology Center.	
176	ILLEGAL Z COMMAND (, ,)	D
Cause	In M32 mode (profiling on), Z-axis is commanded though the profiling is on.	
Action	Delete the Z-axis command code existing after the profiling ON command code.	
177	ILLEGAL Z COMMAND (, ,)	E
Cause	[During tool path check] Z-axis is commanded during profiling on by M32 command.	
Action	Delete the Z-axis command code existing after the profiling ON command code.	
200	SQ HARDWARE ERROR (, ,)	A
Cause	An error is detected at the SQ processing section in the servo control board (SSI).	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
202	REMOTE I/O COMMUNICATION ERR (, ,)	A
Cause	An error has occurred during remote I/O communications.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
400	ILLEGAL FORMAT (, ,)	E
Cause	The format of the data being set is illegal.	
Action	Enter data of the correct format.	
401	ILLEGAL NUMBER INPUT (, ,)	E
Cause	The value being set is too large (small).	
Action	Enter data within the setting range.	
402	MEMORY PROTECT (AUTO OPRAT.) (, ,)	E
Cause	An attempt was made to set the data which cannot be set during automatic operation.	
Action	Enter data after automatic operation has ended.	
403	TOOLPATH IS ON (, ,)	E
Cause	An attempt was made to set the data which cannot be set during tool path drawing.	
Action	Enter data after tool path drawing has been executed.	
404	MEMORY PROTECT (I/O BUSY) (, ,)	E
Cause	An attempt was made to set the data which cannot be set during data communication.	
Action	Enter data after data communication has been executed.	

No.	Message	Resetting method
405	MEMORY PROTECT (, ,)	E
Cause	The write-protect function remains valid.	
Action	Make the write-protect function invalid before entering data.	
406	SAME PROGRAM APPOINT (, ,)	E
Cause	The WNo. set for program copy operation in the program file screen has already been entered.	
Action	Enter an unregistered WNo.	
407	NO DESIGNATED PROGRAM (, ,)	E
Cause	The WNo. set for program copy operation, etc. in the program file screen does not exist.	
Action	Confirm the WNo. in the program file screen.	
408	MEMORY CAPACITY EXCEED (PROG.) (, ,)	E
Cause	The program storing area is full.	
Action	Provide an available location in the program storage memory by, for example, deleting unnecessary programs.	
409	EIA/ISO PROGRAM ERROR (, ,)	E
Cause	Syntax error is entered in EIA/ISO program.	
Action	Correct the syntax errors.	
410	MACRO PROGRAM ERROR (, ,)	E
Cause	Syntax error is entered in user macroprogram.	
Action	Confirm the syntax errors, and enter the correct data.	
411	CALCULATION OVERFLOW (, ,)	E
Cause	The input value exceeds the allowable input range.	
Action	Confirm the input range, and enter the correct data.	
412	CUTTING CND.STORAGE AREA FULL (, ,)	E
Cause	The cutting condition data storing area is full.	
Action	Delete unnecessary cutting condition data.	
413	SAME PROGRAM APPOINT (, ,)	E
Cause	In the program copy operation on the program file screen, the same WNo. as used for editing is set, or WNo. has overlapped in data I/O operation.	
Action	Do not specify the same WNo.	
414	I/O MODE MUST BE SELECTED (, ,)	E
Cause	The “execute” menu function has been selected while data I/O mode is not set.	
Action	Select data I/O mode.	

No.	Message	Resetting method
415	INITIALIZE PROGRAM MEMORY (, ,)	E
Cause	The memory area for storing programs is not initialized or it has been destroyed.	
Action	Initialize the program storage area.	
416	PROGRAM OVER (, ,)	E
Cause	The number of entered programs has reached the limit.	
Action	Delete unnecessary programs.	
420	COPY LINE IS OVER (, ,)	E
Cause	Too many lines are designated for copy operation.	
Action	Specify up to 25 lines to perform a copy.	
421	AXIS IS MOVING (, ,)	E
Cause	The origin setting is selected during the axis movement in manual operation mode.	
Action	Select origin setup, only when no axes are moving.	
424	IMPROPER G-CODE (, ,)	E
Cause	The set G-code cannot be used.	
Action	Enter a G-code present in the G-code list.	
427	NO SERVO DATA (, ,)	E
Cause	There is no data for servo monitor display.	
Action	Restart from servo data acquisition.	
429	INTEGER VALUE OVERFLOW (, ,)	E
Cause	In a cut mode program, the value set for an address where integer data should be set is too large.	
Action	Retry with the correct data.	
430	REAL VALUE OVERFLOW (, ,)	E
Cause	In a cut mode program, the value set for an address where real data should be set is too large.	
Action	Retry with the correct data.	
431	FORMAT ERROR IN CALCULATION (, ,)	E
Cause	Format for the operation in the program is illegal.	
Action	Correct the wrong format.	
432	[ ] MISMATCH (, ,)	E
Cause	Mismatch in the number of “[” and “]” in the program.	
Action	Perform corrections for matching in quantity between “[” and “]”.	

No.	Message	Resetting method
433	( ) MISMATCH (, ,)	E
Cause	Mismatch in the number of “(” and “)” in the program.	
Action	Add a closing bracket to the end of the comment.	
434	DATA IS TO BE INPUT (, ,)	E
Cause	Necessary data setting items are left blank for load/save operation.	
Action	Enter data such as the WNo.	
442	MEMORY PROTECT (AUTO MODE) (, ,)	E
Cause	The origin setting is performed in the automatic operation mode.	
Action	In automatic operation mode, origin setup is not possible. Select manual mode.	
444	STARTING COND. ERR (MANUAL) (, ,)	E
Cause	The cycle start button has been pressed in the manual operation mode.	
Action	Automatic operation cannot be started in manual mode.	
531	ILLEGAL FORMAT (, ,)	E
Cause	The O number of the program having been loaded is “0”.	
Action	A program with O number “0” cannot be loaded.	
532	LOAD IMPOSSIBLE (SIZE OVER) (, ,)	E
Cause	An attempt was made to load a program exceeding the allowable memory capacity of the NC unit.	
Action	For standard specifications, programs exceeding a length of 320 m cannot be loaded.	
533	LOAD IMPOSSIBLE (TOO MANY) (, ,)	E
Cause	An attempt was made to load programs exceeding the allowable number of programs.	
Action	For standard specifications, more than 96 programs cannot be loaded.	
534	LOAD IMPOSSIBLE (AUTO OPE.) (, ,)	E
Cause	An attempt was made to load the program having the same O number as the one assigned to the program presently executed for automatic operation.	
Action	It is not possible to load a program of the same O number as that of the program being used for automatic operation.	
535	STOP POWER IN TAPE READER (, ,)	E
Cause	NC power supply has been turned off during data communication with the tape reader/punch.	
Action	Delete the program being loaded, and reload it.	
537	RS232C PARITY ERROR (, ,)	E
Cause	Illegal parity is found in data communication.	
Action	Review the parity value of the operation parameter.	

No.	Message	Resetting method
538	RS232C OVERRUN ERROR (, ,)	E
Cause	In data communication, the next character is sent while the character received previously was not read.	
Action	The number of stop bits in the operation parameter or the setting of the baud rate does not match. Match the operation parameter to the connected external unit.	
539	RS232C FRAMING ERROR (, ,)	E
Cause	In data communication, stop bit has not been detected in the received characters.	
Action	The number of stop bits in the operation parameter or the setting of the baud rate does not match. Match the operation parameter to the connected external unit.	
541	CONTENTS ARE NOT COINCIDENT (, ,)	E
Cause	The data in tape do not coincide with the data in the NC unit.	
Action	There are disparities in contents between the tape data and the NC unit data.	
547	TAPE READER MIS-CONNECTED (, ,)	E
Cause	The tape reader is not connected, or the tape reader is not in the ready state.	
Action	Connect the cable properly or set up the tape reader for operation.	
548	TAPE PUNCHER MIS-CONNECTED (, ,)	E
Cause	The tape punch is not connected, or the tape punch is not in the ready state.	
Action	Connect the cable properly or set up the tape punch for operation.	
551	MEMORY PROTECT (, ,)	E
Cause	Loading the program has been attempted in spite of the write-protect function remaining valid.	
Action	Make the write-protect function invalid.	
552	PROG. OPERATION NO ALLOWED (, ,)	E
Cause	An attempt was made to load the program having the same O number as the one assigned to the program presently edited.	
Action	It is not possible to load a program of the same O number as that of the program being edited.	
553	NO DESIGNATED WORK No. (, ,)	E
Cause	In program loading operation, program number is specified at neither the NC unit side nor the tape side.	
Action	When the O number is absent in the tape, enter the O number in the NC unit and then load the program.	
555	PARITY H ERROR (, ,)	E
Cause	The number of characters in a block is odd (even in the case of EIA-coded data).	
Action	ISO-coded communications data is of even parity. Correct the tape data. (EIA-coded data is of odd parity.)	
556	PARITY V ERROR (, ,)	E
Cause	When loading a program, the parity for one block was incorrect.	
Action		

No.	Message	Resetting method
557	TAPE READER ERROR (, ,)	E
Cause	An attempt was made to read the data or format which cannot be stored in the NC memory for a program.	
Action	Correct the tape data.	
558	SAME PROGRAM APPOINT (, ,)	E
Cause	In the program load operation, an attempt was made to load the program number already existing in the NC memory.	
Action	Change the corresponding program number within the NC unit (renumber the program), and load the new program number.	
559	NO DESIGNATED PROGRAM (, ,)	E
Cause	In the program save operation, the designated program number does not exist in the NC memory.	
Action	Enter the correct program number.	
570	NO DNC OPTION (, ,)	E
Cause	An option parameter is designated although the option is not selected.	
Action	The DNC option has been specified when the DNC board was not connected.	
571	DNC TIME OVER (, ,)	E
Cause	In DNC communications, no data is received within the specified period.	
Action	The system has failed to receive data from the host CPU within the time specified in system parameter N67.	
572	DNC BOARD ERROR (, ,)	E
Cause	An error has occurred with the DNC board.	
Action	Contact Mazak Technical Center or Technology Center.	
577	RS232C PARITY ERROR (DNC) (, ,)	E
Cause	Parity error in I/O communications.	
Action	Review the parity value of the parameter.	
578	RS232C OVERRUN ERROR (DNC) (, ,)	E
Cause	In I/O communications, while the received character is not read, the next character is received.	
Action	The number of stop bits in the parameter or the setting of the baud rate does not match. Match the parameter to the connected external unit.	
579	RS232C FRAMING ERROR (DNC) (, ,)	E
Cause	In I/O communications, no stop bit is detected for the received character.。	
Action	The number of stop bits in the parameter or the setting of the baud rate does not match. Match the parameter to the connected external unit.	
584	RECEIVED DATA NOT COINCIDENT (, ,)	E
Cause	In DNC communications, the structure of the data received from the host CPU is different. (DC2 and DC4 are not detected.)	
Action	This alarm implies that data has been received during the time interval from completion of startup of the host CPU to the startup of the NC unit. There is no problem since data receiving is repeated automatically.	

No.	Message	Resetting method
590	DNC COMMAND IMPOSSIBLE (, ,)	E
Cause	The command is received from the host CPU with a false machine number.	
Action	Change the machine number of either the host CPU or the NC unit. (Contact Mazak Technical Center or Technology Center.)	
591	REBOOT CNC TO ENABLE PARAMETERS (, ,)	E
Cause	The parameters have been loaded.	
Action	Restart the NC unit so as to make the parameters valid.	
592	RECEIVED ILLEGAL COMMAND (, ,)	E
Cause	Incorrect command is received from the host CPU.	
Action	Change the mode to online, and press the clear key.	
600	ILLEGAL FORMAT (, ,)	C
Cause	The format in the program is incorrect.	
Action	Review the program.	
601	ILLEGAL NUMBER INPUT (, ,)	C
Cause	The numeric value set for an address is outside the allowable range.	
Action	Review the program.	
602	SUB PROGRAM NESTING OVER (, ,)	C
Cause	The nesting level in subprogram call has exceeded the allowable limit.	
Action	Confirm the subprogram call count and then correct the program so that the total call count does not exceed its limit. Limit: Subprograms with G65 and M98 combined can be called up a maximum of eight times.	
603	NO DESIGNATED PROGRAM (, ,)	C
Cause	When starting program execution, the designated program is not found.	
Action	Verify the program number.	
606	DESIGNATED SNo. NOT FOUND (, ,)	C
Cause	In the return operation from a subprogram, or when executing the GOTO command, the designated sequence number is not found.	
Action	Specify the sequence number in the appropriate block.	
607	NO INTERSECTION (, ,)	C
Cause	When executing the tool diameter offset (G41, G42), offset shape cannot be calculated (due to too large an offset value etc.).	
Action	Review the program.	
609	EIA/ISO PROGRAM ERROR (, ,)	C
Cause	Syntax errors are found in the entered EIA/ISO program.	
Action	Correct the syntax errors.	

No.	Message	Resetting method
610	NUMBER OF SAMPLING NOT ENOUGH (, ,)	C
Cause	The profiling table is about to be updated under the status that the number of profiling voltages acquired is insufficient.	
Action	Confirm whether “G139” is inadvertently included in the execution program.	
611	ILLEGAL AXIS NAME (, ,)	C
Cause	The axis address names used in a program do not agree with the axis address names set in the parameters.	
Action	Correct the axis name in the program.	
612	IMPROPER NC ADDRESS (, ,)	C
Cause	An address which is not supported by the NC unit is used.	
Action	Confirm/correct the address in the program, and confirm the specifications.	
613	IMPROPER G-CODE (, ,)	C
Cause	A G-code which is not supported by the NC unit is used.	
Action	Confirm and correct the G-code address in the program.	
614	NEGATIVE T COMMAND (, ,)	C
Cause	A minus value has been designated in the T-code command.	
Action	Confirm and correct the T-code in the program.	
615	NEGATIVE M COMMAND (, ,)	C
Cause	A minus value has been designated in the M-code command.	
Action	Confirm and correct the M-code in the program.	
619	TARGET NOT FOUND ARC (, ,)	C
Cause	Any of the start point, end point or center of the arc is wrong.	
Action	Confirm the address data that specifies the start point, end point, and center of the arc, in the program, and verify the plus/minus direction of the address data.	
620	CENTER NOT FOUND (, ,)	C
Cause	When defining an arc using an R command, the center of the arc cannot be calculated.	
Action	Confirm each address value in the program.	
625	G17-G19 COMMAND IN G68 (, ,)	C
Cause	A plane selection command (G17, G18, G19) is specified while in the G68 mode (coordinate rotation).	
Action	Assign the G68 command, the G69 command (cancellation of coordinate rotation), and the plane selection command, in that order.	
626	G17-G19 COMMAND IN G38-G42 (, ,)	C
Cause	A plane selection command (G17, G18, G19) is specified while in the tool diameter offset mode (G41, G42).	
Action	Before selecting a plane, execute the diameter offset command to completion (execute the cancellation command by assigning G40).	

No.	Message	Resetting method
636	G41,G42,FORMAT ERROR (, ,)	C
Cause	A tool diameter offset command (G40, G41, G42) is specified while in the circular interpolation mode (G02, G03).	
Action	Assign either the linear interpolation command (G01) or the rapid feed command (G00) to the offset command block or the cancellation block. (Modal will be changed to linear interpolation.)	
639	ILLEGAL OFFSET No. (, ,)	C
Cause	In the tool diameter offset mode (G41, G42), the offset number is greater than the supported number of offset sets.	
Action	Confirm the number of offset number sets, and specify any number ranging within the offset number sets.	
643	PROGRAM NO. NOT FOUND (, ,)	C
Cause	When calling a subprogram, the specified subprogram is not found.	
Action	Confirm the program number of the subprogram.	
644	DUPLICATE SUB-CALL (, ,)	C
Cause	More than two subprogram call commands (M98 or G65) are specified in a single block.	
Action	Review the program.	
645	#ERROR (, ,)	C
Cause	When executing a macro, the specified variable number is larger than the allowable variable number.	
Action	Confirm the variable number in the program.	
653	USERMACRO MIS-OPERATION (, ,)	C
Cause	An NC statement and macro statement are specified in the same block.	
Action	Review the program and move the NC statement and the macro statement to blocks different from each other.	
654	TOO MANY MACRO NESTING (, ,)	C
Cause	Nesting level for macro call has exceeded the limit.	
Action	Review the program and perform corrections so that the number of macro calls does not exceed the required value.	
655	USERMACRO ARGUMENT OVER (, ,)	C
Cause	In the macro call, the number of arguments used has exceeded the allowable limit.	
Action	Review the program.	
656	USERMACRO G67 MIS-OPERATION (, ,)	C
Cause	The G67 command is specified while not in the G66 mode.	
Action	Review the program, and enter the G66 command before entering the G67 command.	
659	CALCULATE IMPOSSIBLE (, ,)	C
Cause	Calculation expression format is incorrect.	
Action	Review the program and correct the calculation expression.	

No.	Message	Resetting method
660	ZERO DIVIDE ERROR (, ,)	C
Cause	"0" is used in denominator.	
Action	Review the program and perform corrections so that the denominator of the calculation expression does not become zero.	
661	INTEGER VALUE OVERFLOW (, ,)	C
Cause	During the process of operation, an overflow occurred with integer (-2^{31} or $2^{31}-1$ is exceeded).	
Action	Review the program and perform corrections so that the integral value obtained after the arithmetic operation has been conducted will not exceed -2^{31} or $2^{31}-1$.	
662	REAL VALUE OVERFLOW (, ,)	C
Cause	An overflow is occurred with the data of macro variable.	
Action	Review the macro variables data in the program.	
663	'IF' ERROR (, ,)	C
Cause	An error in "IF [condition] GOTO" statement.	
Action	Review the program.	
664	'WHILE' ERROR (, ,)	C
Cause	An error in "WHILE [condition] DO END" statement.	
Action	Review the program.	
665	GOTO DESIGNATION IS IN DO-END (, ,)	C
Cause	The branch destination specified by GOTO is in blocks of DO END statement.	
Action	Review the program.	
666	WHILE NEST OVER (, ,)	C
Cause	The number of "DO END" in the "WHILE [condition] DO END" statement has exceeded 27.	
Action	Review the program and perform corrections so that the multiplexing level of the "DO END" statement does not exceed 27.	
667	'DO' & 'END' MISMATCH (, ,)	C
Cause	DO and END are not used in pairs.	
Action	Review the program and perform corrections so that "DO END" is paired.	
668	N No. SEARCH (, ,)	C
Cause	In sequence number search processing called by the GOTO state, etc., mismatch in DO and END is found.	
Action	Review the program and perform corrections so that "DO END" is paired.	
686	ILLEGAL G10 L NUMBER (, ,)	C
Cause	In the G10 command, an L number outside the allowable range is specified.	
Action	Change the L number within the program to the specified value.	

No.	Message	Resetting method
687	ILLEGAL G10 CORRECTION No. (, ,)	C
Cause	In the G10 command, an offset number outside the allowable range is specified.	
Action	After confirming the number of offset number sets, specify address P so that the offset number ranges within the number of offset number sets.	
693	NO DIRECT. FOR NEXT MOVE R/C (, ,)	C
Cause	The block following the corner R/C command does not include an axis movement command.	
Action	Change the block following the corner R/C command to the cutting feed command (G01, G02, or G03).	
694	INSUFF. MOVE DISTANCE R/C (, ,)	C
Cause	In the corner R/C command, axis movement distance is smaller than the corner R/C command.	
Action	Since the movement distance value is smaller than the corner R/C value, reduce the corner R/C value below the movement distance value.	
695	INSUFF. NEXT MOVE DIST. R/C (, ,)	C
Cause	In the corner R/C command, axis movement distance in the next block is smaller than the corner R/C command.	
Action	Since the movement distance value in the next block is smaller than the corner R/C value, reduce the corner R/C value below the movement distance value.	
703	SKIP SPEED ZERO (, ,)	C
Cause	In the G31 (skip) command, no feed rate F command is specified.	
Action	Add skipping feed rate F to the block that includes G31.	
708	SKIP COMMAND DURING OFFSET (, ,)	C
Cause	The G31 (skip) command is specified while in the tool diameter offset mode (G41, G42).	
Action	Correct the program so that the execution of the skipping command is preceded by the execution of the G40 command (cancellation of diameter offset).	
709	OFFSET INTERFERENCE (, ,)	C
Cause	An interference error has occurred during the execution of the diameter offset command (G41, G42).	
Action	Reduce the diameter offset value below the radius of the arc.	
720	ILLEGAL BEAM OFFSET VALUE (, ,)	C
Cause	The U-axis offset data is not correct.	
Action	Review the U-axis offset data.	
800	ILLEGAL FORMAT (, ,)	E
Cause	The format in the program is incorrect.	
Action	Review the program.	
801	ILLEGAL NUMBER INPUT (, ,)	E
Cause	The numeric value set for an address is outside the allowable range.	
Action	Review the program.	

No.	Message	Resetting method
802	SUB PROGRAM NESTING OVER (, ,)	E
Cause	The nesting level in subprogram call has exceeded the allowable limit.	
Action	Confirm the subprogram call count and then correct the program so that the total call count does not exceed its limit. Limit: Subprograms with G65 and M98 combined can be called up a maximum of eight times.	
803	NO DESIGNATED PROGRAM (, ,)	E
Cause	When starting program execution, the designated program is not found.	
Action	Verify the program number.	
806	DESIGNATED SNo. NOT FOUND (, ,)	E
Cause	In the return operation from a subprogram, or when executing the GOTO command, the designated sequence number is not found.	
Action	Specify the sequence number in the appropriate block.	
807	NO INTERSECTION (, ,)	E
Cause	When executing the tool diameter offset (G41, G42), offset shape cannot be calculated (due to too large an offset value etc.).	
Action	Review the program.	
809	EIA/ISO PROGRAM ERROR (, ,)	E
Cause	Syntax errors are found in the entered EIA/ISO program.	
Action	Correct the syntax errors.	
811	ILLEGAL AXIS NAME (, ,)	E
Cause	The axis address names used in a program do not agree with the axis address names set in the parameters.	
Action	Correct the axis name in the program.	
812	IMPROPER NC ADDRESS (, ,)	E
Cause	An address which is not supported by the NC unit is used.	
Action	Confirm/correct the address in the program, and confirm the specifications.	
813	IMPROPER G-CODE (, ,)	E
Cause	A G-code which is not supported by the NC unit is used.	
Action	Confirm and correct the G-code address in the program.	
819	TARGET NOT FOUND ARC (, ,)	E
Cause	Any of the start point, end point or center of the arc is wrong.	
Action	Confirm the address data that specifies the start point, end point, and center of the arc, in the program, and verify the plus/minus direction of the address data.	
820	CENTER NOT FOUND (, ,)	E
Cause	When defining an arc using an R command, the center of the arc cannot be calculated.	
Action	Confirm each address value in the program.	

No.	Message	Resetting method
825	G17-G19 COMMAND IN G68 (, ,)	E
Cause	A plane selection command (G17, G18, G19) is specified while in the G68 mode (coordinate rotation).	
Action	Assign the G68 command, the G69 command (cancellation of coordinate rotation), and the plane selection command, in that order.	
826	G17-G19 COMMAND IN G38-G42 (, ,)	E
Cause	A plane selection command (G17, G18, G19) is specified while in the tool diameter offset mode (G41, G42).	
Action	Before selecting a plane, execute the diameter offset command to completion (execute the cancellation command by assigning G40).	
836	G41,G42,FORMAT ERROR (, ,)	E
Cause	A tool diameter offset command (G40, G41, G42) is specified while in the circular interpolation mode (G02, G03).	
Action	Assign either the linear interpolation command (G01) or the rapid feed command (G00) to the correction command block or the cancellation block. (Modal will be changed to linear interpolation.)	
839	ILLEGAL OFFSET No. (, ,)	E
Cause	In the tool diameter offset mode (G41, G42), the offset number is greater than the supported number offset sets.	
Action	Confirm the number of offset number sets, and specify any number ranging within the offset number sets.	
843	PROGRAM NO. NOT FOUND (, ,)	E
Cause	When calling a subprogram, the specified subprogram in not found.	
Action	Confirm the program number of the subprogram.	
844	DUPLICATE SUB-CALL (, ,)	E
Cause	More than two subprogram call commands (M98 or G65) are specified in a single block.	
Action	Review the program.	
845	#ERROR (, ,)	E
Cause	When executing a macro, the specified variable number is larger than the allowable variable number.	
Action	Confirm the variable number in the program.	
853	USERMACRO MIS-OPERATION (, ,)	E
Cause	An NC statement and macro statement are specified in the same block.	
Action	Review the program and move the NC statement and the macro statement to blocks different from each other.	
854	TOO MANY MACRO NESTING (, ,)	E
Cause	Nesting level for macro call has exceeded the limit.	
Action	Review the program and perform corrections so that the number of macro calls does not exceed the required value.	
855	USERMACRO ARGUMENT OVER (, ,)	E
Cause	In the macro call, the number of arguments used has exceeded that allowable limit.	
Action	Review the program.	

No.	Message	Resetting method
856	USERMACRO G67 MIS-OPERATION (, ,)	E
Cause	The G67 command is specified while not in the G66 mode.	
Action	Review the program, and enter the G66 command before entering the G67 command.	
859	CALCULATE IMPOSSIBLE (, ,)	E
Cause	Calculation expression format is incorrect.	
Action	Review the program and correct the calculation expression.	
860	ZERO DIVIDE ERROR (, ,)	E
Cause	“0” is used in denominator.	
Action	Review the program and perform corrections so that the denominator of the calculation expression does not become zero.	
861	INTEGER VALUE OVERFLOW (, ,)	E
Cause	During the process of operation, an overflow occurred with integer (-2^{31} or $2^{31}-1$ is exceeded).	
Action	Review the program and perform corrections so that the integral value obtained after the arithmetic operation has been conducted will not exceed -2^{31} or $2^{31}-1$.	
862	REAL VALUE OVERFLOW (, ,)	E
Cause	An overflow is occurred with the data of macro variable.	
Action	Review the macro variables data in the program.	
863	‘IF’ ERROR (, ,)	E
Cause	An error is found in “IF [condition] GOTO” statement.	
Action	Review the program.	
864	‘WHILE’ ERROR (, ,)	E
Cause	An error is found in “WHILE [condition] DO END” statement.	
Action	Review the program.	
865	GOTO DESIGNATION IS IN DO-END (, ,)	E
Cause	The branch destination specified by GOTO is in blocks of DO-END statement.	
Action	Review the program.	
866	WHILE NEST OVER (, ,)	E
Cause	The number of “DO-END” in the “WHILE [condition] DO END” statement has exceeded 27.	
Action	Review the program and perform corrections so that the multiplexing level of the “DO END” statement does not exceed 27.	
867	‘DO’ & ‘END’ MISMATCH (, ,)	E
Cause	DO and END are not used in pairs.	
Action	Review the program and perform corrections so that “DO END” is paired.	

No.	Message	Resetting method
868	N No. SEARCH (, ,)	E
Cause	In sequence number search processing called by the GOTO state, etc., mismatch in DO and END is found.	
Action	Review the program and perform corrections so that “DO END” is paired.	
886	ILLEGAL G10 L NUMBER (, ,)	E
Cause	In the G10 command, an L number outside the allowable range is specified.	
Action	Change the L number within the program to the specified value.	
887	ILLEGAL G10 CORRECTION No. (, ,)	E
Cause	In the G10 command, an offset number outside the allowable range is specified.	
Action	After confirming the number of offset number sets, specify address P so that the offset number ranges within the number of offset number sets.	
893	NO DIRECT. FOR NEXT MOVE R/C (, ,)	E
Cause	The block following the corner R/C command does not include an axis movement command.	
Action	Change the block following the corner R/C command to the cutting feed command (G01, G02, or G03).	
894	INSUFF. MOVE DISTANCE R/C (, ,)	E
Cause	In the corner R/C command, axis movement distance is smaller than the corner R/C command.	
Action	Since the movement distance value is smaller than the corner R/C value, reduce the corner R/C value below the movement distance value.	
895	INSUFF. NEXT MOVE DIST. R/C (, ,)	E
Cause	In the corner R/C command, axis movement distance in the next block is smaller than the corner R/C command.	
Action	Since the movement distance value in the next block is smaller than the corner R/C value, reduce the corner R/C value below the movement distance value.	
903	SKIP SPEED ZERO (, ,)	E
Cause	In the G31 (skip) command, no feedrate F command is specified.	
Action	Add skipping feed rate F to the block that includes G31.	
908	SKIP COMMAND DURING OFFSET (, ,)	E
Cause	The G31 (skip) command is specified while in the tool diameter offset mode (G41, G42).	
Action	orrect the program so that the execution of the skipping command is preceded by the execution of the G40 command (cancellation of diameter offset).	
909	OFFSET INTERFERENCE (, ,)	E
Cause	interference error has occurred during the execution of the G41, G42 command.	
Action	Reduce the diameter offset value below the radius of the arc.	

No.	Message	Resetting method
1500 1501 1502 1503 1504 1505 1506 1507	X AXIS ENCODER COMM. ERROR Y AXIS ENCODER COMM. ERROR Z AXIS ENCODER COMM. ERROR 4 AXIS ENCODER COMM. ERROR 5 AXIS ENCODER COMM. ERROR W AXIS ENCODER COMM. ERROR 7 AXIS ENCODER COMM. ERROR 8 AXIS ENCODER COMM. ERROR (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1508 1509 1510 1511 1512 1513 1514 1515	X AXIS ENCODER BATTERY ERROR Y AXIS ENCODER BATTERY ERROR Z AXIS ENCODER BATTERY ERROR 4 AXIS ENCODER BATTERY ERROR 5 AXIS ENCODER BATTERY ERROR W AXIS ENCODER BATTERY ERROR 7 AXIS ENCODER BATTERY ERROR 8 AXIS ENCODER BATTERY ERROR (, ,)	A
Cause	The battery voltage has dropped.	
Action	Replace the battery. Contact Mazak Technical Center or Technology Center.	
1530 1531 1532 1533	5 AXIS SERVO Z SIGNAL ERROR W AXIS SERVO Z SIGNAL ERROR 7 AXIS SERVO Z SIGNAL ERROR 8 AXIS SERVO Z SIGNAL ERROR (, ,)	A
Cause	The encoder signal (Z-phase) has not been detected during axis movement or homing after power-on.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1536 1537 1538 1539	5 AXIS SERVO SIGNAL ERROR 2 W AXIS SERVO SIGNAL ERROR 2 7 AXIS SERVO SIGNAL ERROR 2 8 AXIS SERVO SIGNAL ERROR 2 (, ,)	A
Cause	An error is detected in communications between the servo controller and the amplifier.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1540 1541 1542 1543	5 DETECTING NO SIGNAL W DETECTING NO SIGNAL 7 DETECTING NO SIGNAL 8 DETECTING NO SIGNAL (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	The encoder is likely to be malfunctioning. Contact Mazak Technical Center or Technology Center.	
1544 1545 1546 1547	5 DETECTING NO SIGNAL 2 W DETECTING NO SIGNAL 2 7 DETECTING NO SIGNAL 2 8 DETECTING NO SIGNAL 2 (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	The encoder is likely to be malfunctioning. Contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
1548 1549 1550 1551	5 MAGNETIC POS. DETECT MALF W MAGNETIC POS. DETECT MALF 7 MAGNETIC POS. DETECT MALF 8 MAGNETIC POS. DETECT MALF (, ,)	A
Cause	An error has occurred during encoder signal transmission between the servomotor and the NC unit.	
Action	The encoder is likely to be malfunctioning. Contact Mazak Technical Center or Technology Center.	
1552 1553 1554 1555	5 SERVO LAG EXCESS W SERVO LAG EXCESS 7 SERVO LAG EXCESS 8 SERVO LAG EXCESS (, ,)	A
Cause	An error between the actual position and the programmed position has exceeded the allowable limit due to mechanical interference, etc.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1556 1557 1558 1559	5 OVER LOAD W OVER LOAD 7 OVER LOAD 8 OVER LOAD (, ,)	B
Cause	The motor is overloaded due to operation exceeding the motor's continuous rating and mechanical interference.	
Action	If the situation cannot be remedied by reducing the load, please contact Mazak Technical Center or Technology Center.	
1560 1561 1562 1563	5 OVER LOAD 2 W OVER LOAD 2 7 OVER LOAD 2 8 OVER LOAD 2 (, ,)	B
Cause	The motor has been operated exceeding its rated output.	
Action	If the situation cannot be remedied by reducing the load, please contact Mazak Technical Center or Technology Center.	
1564 1565 1566 1567	5 AXIS SERVO SIGNAL ERROR W AXIS SERVO SIGNAL ERROR 7 AXIS SERVO SIGNAL ERROR 8 AXIS SERVO SIGNAL ERROR (, ,)	A
Cause	An error is detected in communications between the servo controller and the amplifier.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1568 1569 1570 1571	5 A/D ERROR W A/D ERROR 7 A/D ERROR 8 A/D ERROR (, ,)	A
Cause	An error has occurred in the axis A/D converter.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1572 1573 1574 1575	5 INVERTER CURRENT OVERLOAD W INVERTER CURRENT OVERLOAD 7 INVERTER CURRENT OVERLOAD 8 INVERTER CURRENT OVERLOAD (, ,)	A
Cause	An over current is detected due to burning of servomotor, short in the load, grounding to the earth, etc.	
Action	Be sure to turn off the main power before troubleshooting. Check the motor power line for short circuits such as a ground fault, and if any short circuits are detected, remove the causes. If the alarm is not cleared even so, please contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
1576 1577 1578 1579	5 OVER VOLTAGE W OVER VOLTAGE 7 OVER VOLTAGE 8 OVER VOLTAGE (, ,)	A
Cause	An over voltage is detected due to an error in the control circuit of the servo amplifier or an error of the power supply voltage.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1580 1581 1582 1583	5 MOTOR OVERHEAT W MOTOR OVERHEAT 7 MOTOR OVERHEAT 8 MOTOR OVERHEAT (, ,)	B
Cause	The motor has been overheated due to operation exceeding the motor's continuous rating.	
Action	Turn main power off and then turn it back on. Reduce the frequency of acceleration/deceleration to prevent overheating.	
1584 1585 1586 1587	5 AXIS POWER MODULE MALFUNCTION W AXIS POWER MODULE MALFUNCTION 7 AXIS POWER MODULE MALFUNCTION 8 AXIS POWER MODULE MALFUNCTION (, ,)	A
Cause	The servo amplifier circuit protector has operated.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1588 1589 1590 1591	5 OVER REGENERATION W OVER REGENERATION 7 OVER REGENERATION 8 OVER REGENERATION (, ,)	B
Cause	Acceleration/deceleration has been repeated too often.	
Action	Turn main power off and then turn it back on. Reduce the frequency of acceleration/deceleration to prevent overheating.	
1592 1593 1594 1595	5 DYNAMIC BRAKE MALFUNCTION W DYNAMIC BRAKE MALFUNCTION 7 DYNAMIC BRAKE MALFUNCTION 8 DYNAMIC BRAKE MALFUNCTION (, ,)	A
Cause	The dynamic brake has been operated although dynamic brake command is not given.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1596 1597 1598 1599	5 POWER FAIL W POWER FAIL 7 POWER FAIL 8 POWER FAIL (, ,)	A
Cause	The supply voltage of the amplifier is too low.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
1602	5+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	

No.	Message	Resetting method
1603	5– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
1604	W+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
1605	W– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
1606	7+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
1607	7– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
1608	8+ OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	
1609	8– OVERTRAVEL (, ,)	—
Cause	The axis is in the hardware overtravel state.	
Action	1. Press the OT release key and the reset key together. The servo will be turned on. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction while holding down the OT release key. 4. Return the axis to its home position by selecting homing mode.	

No.	Message	Resetting method
1610	5– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1611	5+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1612	W– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1613	W+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1614	7– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1615	7+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1616	8– SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	
1617	8+ SOFT OT (, ,)	—
Cause	The axis is in the software overtravel state.	
Action	1. Press the reset key. 2. Select manual handle mode. 3. Exit the overtravel area by rotating the handle in the opposite direction.	

No.	Message	Resetting method
2000	Abnormal CPU status (Vcore) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2001	Abnormal CPU status (Vtt) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2002	Abnormal CPU status (+1.8V) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2003	Abnormal CPU status (+3.3V) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2004	Abnormal CPU status (+5V) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2005	Abnormal CPU status (–5V) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2006	Abnormal CPU status (+12V) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2007	Abnormal CPU status (–12V) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2008	Abnormal CPU status (+3.3Vsb) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2009	Abnormal CPU status (Vbat) (, ,)	A
Cause	A normal supply voltage is not supplied to the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
2010	Abnormal CPU status (CPU fan) (, ,)	A
Cause	Either a normal supply voltage is not supplied to the CPU-cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the CPU-cooling fan is causing an unusual fan speed.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2011	Abnormal CPU status (PSU/CHASSIS fan) (, ,)	A
Cause	Either a normal supply voltage is not supplied to the PSU (Power Supply Unit) cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the PSU-cooling fan is causing an unusual fan speed.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2012	Abnormal CPU status (CPU temp) (, ,)	A
Cause	An unusual CPU temperature has been detected on the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2013	Abnormal CPU status (PSU/CHASSIS temp) (, ,)	A
Cause	An unusual PSU/chassis temperature has been detected on the main board.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
2020	Abnormal CPU status (Vcore) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2021	Abnormal CPU status (Vtt) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2022	Abnormal CPU status (+1.8V) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2023	Abnormal CPU status (+3.3V) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2024	Abnormal CPU status (+5V) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2025	Abnormal CPU status (–5V) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
2026	Abnormal CPU status (+12V) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2027	Abnormal CPU status (–12V) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2028	Abnormal CPU status (+3.3Vsb) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2029	Abnormal CPU status (Vbat) (, ,)	E
Cause	A normal supply voltage is not supplied to the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2030	Abnormal CPU status (CPU fan) (, ,)	E
Cause	Either a normal supply voltage is not supplied to the CPU-cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the CPU-cooling fan is causing an unusual fan speed (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2031	Abnormal CPU status (PSU/CHASSIS fan) (, ,)	E
Cause	Either a normal supply voltage is not supplied to the PSU (Power Supply Unit) cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the PSU-cooling fan is causing an unusual fan speed (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2032	Abnormal CPU status (CPU temp) (, ,)	E
Cause	An unusual CPU temperature has been detected on the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2033	Abnormal CPU status (PSU/CHASSIS temp) (, ,)	E
Cause	An unusual PSU/chassis temperature has been detected on the main board (the current situation is not serious).	
Action	There is no problem associated with machine operation at present, but the future possible change for the worse is likely to result in a serious alarm. Contact Mazak Technical Center or Technology Center.	
2040	Turning off by abnormal CPU status (Vcore) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
2041	Turning off by abnormal CPU status (Vtt) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2042	Turning off by abnormal CPU status (+1.8V) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2043	Turning off by abnormal CPU status (+3.3V) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2044	Turning off by abnormal CPU status (+5V) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2045	Turning off by abnormal CPU status (–5V) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2046	Turning off by abnormal CPU status (+12V) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2047	Turning off by abnormal CPU status (–12V) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2048	Turning off by abnormal CPU status (+3.3Vsb) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2049	Turning off by abnormal CPU status (Vbat) (, ,)	—
Cause	A normal supply voltage is not supplied to the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
2050	Turning off by abnormal CPU status (CPU fan) (, ,)	—
Cause	Either a normal supply voltage is not supplied to the CPU-cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the CPU-cooling fan is causing an unusual fan speed (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2051	Turning off by abnormal CPU status (PSU/CHASSIS fan) (, ,)	—
Cause	Either a normal supply voltage is not supplied to the PSU (Power Supply Unit) cooling fan on the main board, or the presence of a physical interfering object at the rotating section of the PSU-cooling fan is causing an unusual fan speed (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2052	Turning off by abnormal CPU status (CPU temp) (, ,)	—
Cause	An unusual CPU temperature has been detected on the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
2053	Turning off by abnormal CPU status (PSU/CHASSIS temp) (, ,)	—
Cause	An unusual PSU/chassis temperature has been detected on the main board (the current situation is serious).	
Action	Power has been automatically interrupted for preventing damage to the main board from spreading. Turn power back on. If the same alarm recurs even so, contact Mazak Technical Center or Technology Center.	
9000	INTERNAL ALARM (, ,)	C
Cause	An unexpected alarm has occurred.	
Action	Please contact Mazak Technical Center or Technology Center and provide them with information useful for troubleshooting, such as the six-digit number displayed next to the alarm message, the situation where the alarm occurred, and the operations that you performed at that time.	
9010	INTERNAL WARNING (, ,)	E
Cause	An unexpected warning has occurred.	
Action	Please contact Mazak Technical Center or Technology Center and provide them with information useful for troubleshooting, such as the six-digit number displayed next to the alarm message, the situation where the alarm occurred, and the operations that you performed at that time.	

B. No. 100000 to 407000

No.	Message	Resetting method
104017	Arguments after M98 are ineffective. Use G65. (, ,)	C
Cause	Arguments are set in M98.	
Action	Use G65 when arguments are to be set.	
220107	Please insert M31 before M30 (, ,)	C
Cause	Program termination has been executed during profiling.	
Action	Review and correct the program so that profiling is turned off before program termination.	
220108	Please insert M31 before G28/G30 (, ,)	C
Cause	Executing the homing command has been attempted during profiling.	
Action	Review and correct the program so that profiling is turned off before the execution of the homing command.	
220109	Please insert M31 before G53 (, ,)	C
Cause	Executing the machine coordinate command has been attempted during profiling.	
Action	Review and correct the program so that profiling is turned off before the execution of the machine coordinate command.	
220116	restart block not found (, ,)	C
Cause	The block specified as the restart positon does not exist.	
Action	Reconfirm from where the program is to be restarted, and then execute the restarting command.	
300999	ILLEGAL INTERRUPT in IP ! (, nnn ,)	A
Cause	An invalid interrupt has been entered into the CPU.	
Action	Please contact Mazak Technical Center or Technology Center and report the alarm number and the three-digit number (nnn) displayed to the right of the alarm message.	
301100	Save condition again (Updated cutting condition file) (, ,)	E
Cause	The format of the machining conditions (CTQ) has been updated.	
Action	Open the machining conditions (CTQ) file and resave it.	
301401 301402	CTQ data is not correct, out of range CTQ data (combo) is not correct, out of range (, ,)	E
Cause	The CTQ file contains data errors.	
Action	Open the CTQ file and resave it.	
301500	Tool Data is not correct (, ,)	E
Cause	The machine status and the tool registration do not match.	
Action	Correct the tool registration according to the torch set up on the machine.	

No.	Message	Resetting method
301501	ATC is running, can not change now (, ,)	E
Cause	Tool data changing has been attempted during ATC execution.	
Action	Clear the message by pressing the clear key.	
301510	Setting tool No is not correct, please set again (, ,)	E
Cause	The setting method for the current tool number is wrong.	
Action	Correct the tool number according to the particular status of the machine.	
301550	G22 Command Error (, ,)	D
Cause	The ATC command with G22 results in the nozzle to have to be mounted without the torch having been selected correctly.	
Action	Check the torch registration data on the **TOOL DATA** screen to correct the argument T in the ATC command (G22 T_ Z_ W_) and then execute the ATC command anew.	
301551	Tool not found (, ,)	D
Cause	The argument T in an ATC command block with G22 is not correct.	
Action	1. Correct the erroneous torch number specified as an argument T (smaller than zero [0], or larger than the maximum number of available torches [4 and 6 for the standard machine and particularly for HG612, respectively, or 20 for machines with a magazine]). 2. Correct the erroneous lens size specified as an argument T (smaller than zero [0], or larger than the maximum permissible value [399]).	
301552	Nozzle not found (, ,)	D
Cause	The argument Z in an ATC command block with G22 is not correct.	
Action	1. Correct the erroneous nozzle number specified as an argument Z (smaller than zero [0], or larger than the maximum permissible number [10]). 2. The torch mounted on the head cannot be returned to the torch holder directly without the nozzle having been removed. Return the nozzle beforehand (as required by G22Z0W0). 3. The tool change command for a laser torch must always be given in a format for mounting both torch and nozzle (G22T_Z_W_); a G22 command with torch designation only (G22T_) is inadmissible. 4. Correct the erroneous nozzle size specified as an argument Z (smaller than zero [0], or larger than the maximum permissible value [9.9]).	
301600	CCD adjust error (, ,)	C
Cause	The nozzle data is incorrect.	
Action	Confirm whether the nozzle data is correct, and conduct any necessary corrections.	
301601	CCD out of position (, ,)	C
Cause	The execution position of the CCD function is wrong.	
Action	Press the reset key and move the torch to the correct position above the CCD camera.	
301602	Nozzle is outside of CCD spec. (, ,)	E
Cause	The CCD function cannot be used for the nozzle.	
Action	Cancel the message by pressing the clear key.	

No.	Message	Resetting method
302051	can not update program monitor (, ,)	C
Cause	The program monitor cannot be updated properly. A system error is occurring.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302052	not correct mode (, ,)	C
Cause	Invalid mode has been selected. A system error is occurring.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302053	not mdi mode (, ,)	C
Cause	The system is not in MDI mode. A system error is occurring.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302061	preview not ready (, ,)	E
Cause	The REVIEW command has been issued under the write-protected status of the file.	
Action	Change the mode by pressing the reset key.	
302071	mdi text size over (, ,)	E
Cause	The MDI text size is too large.	
Action	Reduce the MDI text size.	
302072	mdi text error (, ,)	E
Cause	There are errors in the MDI program.	
Action	Correct the program.	
302101	Could not open CTQ file (, ,)	E
Cause	The CTQ file does not exist.	
Action	Create the CTQ file.	
302102	No cutting condition file (, ,)	E
Cause	The machining conditions selected in the program do not exist.	
Action	Create the machining conditions selected in the program.	
302130	Not project file (, ,)	E
Cause	Editing the machining conditions data has been attempted under a non-project foreground status.	
Action	Clear the message by pressing the clear key.	
302131	common ctq file is no selection (, ,)	E
Cause	Before CTQ file was selected, CTQ file editing has been attempted.	
Action	Be sure to select the file before editing it.	

No.	Message	Resetting method
302140	No Input, material or thickness (, ,)	E
Cause	You have attempted creating the CTQ file without entering the name/plate thickness of the material.	
Action	Enter the name/plate thickness of the material.	
302141	Cutting condition is already exist (, ,)	E
Cause	Creation of existing CTQ has been attempted.	
Action	Change the name/plate thickness of the material.	
302201	The selected file is not a ctq file (, ,)	E
Cause	The extension is not the specified one.	
Action	Confirm the extension of the file.	
302301	The selected file is not a < *.cnc > file (, ,)	E
Cause	The extension is not the specified one	
Action	Confirm the extension of the file.	
302503	file system memory error (, ,)	E
Cause	The memory cannot be reserved.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302504	file system error (, ,)	E
Cause	The file system is abnormal.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302505	file size error (, ,)	E
Cause	The file size has exceeded the specified capacity.	
Action	Reduce the file capacity.	
302506	file dir name is too long (, ,)	E
Cause	The folder name is in excess of the specified length.	
Action	Make the folder name shorter.	
302507	file name is too long (, ,)	E
Cause	The file name is in excess of the specified length.	
Action	Make the file name shorter.	
302508	Could not change file owner (, ,)	E
Cause	The system has failed to change the owner of the file.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
302509	Could not change file mode (, ,)	E
Cause	The system has failed to change the mode of the file.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302511	Could not open markerfile (, ,)	E
Cause	The specified marker file does not exist or is damaged.	
Action	Check the file.	
302512	Marker file empty (, ,)	E
Cause	Data is missing in the designated marker file.	
Action	Create marker data.	
302515	Could not read ctqfile data (, ,)	E
Cause	The CTQ file cannot be read.	
Action	Create the correct CTQ file.	
302516	Could not open ctqfile (, ,)	E
Cause	The CTQ file has not been found.	
Action	Create the CTQ file.	
302517	No cutting condition file (, ,)	E
Cause	The machining conditions selected in the program do not exist.	
Action	Confirm whether the machining conditions file selected in the program exists.	
302521	Could not open eiafile (, ,)	E
Cause	The EIA file does not exist.	
Action	Create the EIA file.	
302522	Eia file empty (, ,)	E
Cause	Data is missing in the EIA file.	
Action	Create EIA data.	
302525	Could not read file data (, ,)	E
Cause	The file does not exist or is damaged. (The system has failed to read the file.)	
Action	Confirm whether the correct file exists.	
302526	Could not copy file data (, ,)	E
Cause	The file does not exist or is damaged. (The system has failed to copy the file.)	
Action	Confirm whether the correct file exists.	

No.	Message	Resetting method
302527	Could not read merge eia file data (, ,)	E
Cause	The file does not exist or is damaged. (The system has failed to read the file with combined subprograms.)	
Action	Confirm whether the correct file exists.	
302530	Preview failed, program syntax error (, ,)	E
Cause	The program contains errors.	
Action	Correct the program.	
302531	Could not load program now (, ,)	E
Cause	Automatic operation is in progress.	
Action	Terminate automatic operation and then reselect the program.	
302532	Could not update foreground program (, ,)	E
Cause	Automatic operation is in progress. The file does not exist or the file system is abnormal.	
Action	Confirm whether the program has been selected during automatic operation. Confirm whether the selected file is present.	
302534	Could not load dnc program (, ,)	E
Cause	Automatic operation is in progress. The DNC file does not exist or the file system is abnormal.	
Action	Confirm whether the program has been selected during automatic operation. Confirm whether the DNC file is present in the specified folder.	
302535	Could not copy dnc program (, ,)	E
Cause	The DNC program does not exist in the primary folder or the extension is wrong.	
Action	Put the correct program into the primary folder.	
302536	DNC program file does not exist (, ,)	E
Cause	The DNC program file does not exist in the primary folder.	
Action	Put the correct program into the primary folder.	
302537	Marker program file does not exist (, ,)	E
Cause	Although the DNC program is an intelligent program, a marker file is missing in the program.	
Action	Confirm whether the output from the CAM side is correct.	
302538	EIA program file does not exist (, ,)	E
Cause	Although the DNC program is an EIA program, an EIA file is missing in the program.	
Action	Confirm whether the output from the CAM side is correct.	
302539	Project data file does not exist (, ,)	E
Cause	Although the DNC program is an intelligent program, an attribute file is missing in the program.	
Action	Confirm whether the output from the CAM side is correct.	

No.	Message	Resetting method
302541	Could not open directory (, ,)	E
Cause	The designated folder does not exist.	
Action	Confirm whether the folder exists.	
302542	file does not exist (, ,)	E
Cause	The designated file does not exist.	
Action	Confirm whether the file exists.	
302543	Project files do not exist (, ,)	E
Cause	A project does not exist in the designated folder.	
Action	Confirm whether the project exists.	
302544	few files exist (, ,)	E
Cause	Multiple files exist in the DNC primary folder.	
Action	Put one DNC file into the primary folder.	
302545	few project exist (, ,)	E
Cause	Multiple projects exist in the DNC primary folder.	
Action	Put one DNC project into the primary folder.	
302546	Could not delete files (, ,)	E
Cause	The system has failed to delete the file(s) from the DNC primary folder.	
Action	Confirm whether the file to be deleted exists in the DNC primary folder, and delete the file.	
302547	Could not make project files (, ,)	E
Cause	The MSS file for DNC is abnormal.	
Action	Check the MSS file.	
302551	Could not open project data file (, ,)	E
Cause	The project file does not exist.	
Action	Create the project file.	
302552	Project data file empty (, ,)	E
Cause	The project file does not contain data.	
Action	Create project data.	
302561	Could not read project data file (, ,)	E
Cause	The project file cannot be read.	
Action	Create the correct project file.	

No.	Message	Resetting method
302562	Could not update ctq data (, ,)	E
Cause	The CTQ file of the specified project does not exist or is damaged.	
Action	Confirm whether the CTQ file in the project is present.	
302571	Could not merge sub program (, ,)	E
Cause	The subprogram does not exist or the O number of the subprogram is wrong.	
Action	Create a subprogram of the correct O number.	
302572	Sub program file name size over max: 8 (, ,)	E
Cause	The number of characters in the subprogram name is too large.	
Action	Limit the number of characters to range within specifications.	
302581	This is foreground program (, ,)	E
Cause	Renaming or deleting of the foreground program has been attempted.	
Action	Clear the message by pressing the clear key. Foreground programs cannot be renamed or deleted. Select a program that can be renamed or deleted.	
302582	Program file is not selected (, ,)	E
Cause	Program selection has been attempted before a file was selected.	
Action	Select a file before selecting a program.	
302583	Program size over (, ,)	E
Cause	The program size has exceeded the specified capacity.	
Action	Reduce the capacity of the program.	
302586	Now compiling file!!! (, ,)	E
Cause	You have made an attempt to edit the program during its compile process.	
Action	Wait for a while and then restart the edit operations.	
302587	Now loading file!!! (, ,)	E
Cause	You have made an attempt to edit the program during its loading into the CNC unit.	
Action	Wait for a while and then restart the edit operations.	
302600	could not open directory (, ,)	E
Cause	The specified folder does not exist.	
Action	Confirm whether the folder exists	
302601	could not open project directory (, ,)	E
Cause	The folder of the designated project has not been found.	
Action	Confirm the folder.	

No.	Message	Resetting method
302602	could not open eia directory (, ,)	E
Cause	The folder of the designated EIA file has not been found.	
Action	Confirm the folder.	
302605	could not make directory (, ,)	E
Cause	The folder cannot be created.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
302611	Could not open marker file (, ,)	E
Cause	The specified marker file does not exist or is damaged.	
Action	Check the file.	
302612	Marker file empty (, ,)	E
Cause	Data is missing in the designated marker file.	
Action	Create marker data.	
302615	Marker program already exists (, ,)	E
Cause	Creation of an existing marker file has been attempted.	
Action	Change the project name.	
302621	Could not open eia file (, ,)	E
Cause	The EIA file does not exist.	
Action	Create the EIA file.	
302622	Eia file empty (, ,)	E
Cause	Data is missing in the EIA file.	
Action	Create EIA data.	
302625	Eia program already exists (, ,)	E
Cause	Creation of an existing EIA file has been attempted.	
Action	Change the EIA file name.	
302631	Could not open project file (, ,)	E
Cause	The specified project does not exist or is damaged.	
Action	Confirm the project.	
302632	Project file empty (, ,)	E
Cause	The project file does not contain data.	
Action	Create project data.	

No.	Message	Resetting method
302641	Ctq file is missing (, ,)	E
Cause	The designated CTQ file does not exist.	
Action	Confirm the CTQ file.	
302651	Could not write project file data (, ,)	E
Cause	The project attributes file is damaged.	
Action	Create the correct project.	
302662	Same file already exists (, ,)	E
Cause	An existing file name has been entered.	
Action	Enter a new file name.	
302663	not correct mode (, ,)	E
Cause	You have made an attempt to change the selected foreground program in MDI mode.	
Action	Select the program in an NC mode other than MDI.	
303401	Toolpath display buffer full (, ,)	E
Cause	Drawing has been aborted because the maximum number of tool path blocks which can be displayed has been exceeded.	
Action	Although the tool path display is not completed, this has no effects on program execution. Clear the message by pressing the clear key.	
303402	Toolpath for one pallet displayed (, ,)	E
Cause	Only the machining path for the first pallet has been displayed and drawing aborted.	
Action	Although machining data for more than one pallet is present in one program, only the machining path for the first pallet is displayed. Even if this message is displayed, program execution will not be affected. Clear the message by pressing the clear key.	
303403	Interference (, ,)	E
Cause	The amount of beam diameter offset is too large for the programmed shape. Unexpected microblocks are inserted.	
Action	Check whether the amount of beam diameter offset is correct. Check for unexpected microblocks in the machining program.	
307011	Could not open Marker file (, ,)	E
Cause	The specified marker file does not exist or is damaged.	
Action	Check the file.	
307012	Marker file empty (, ,)	E
Cause	Data is missing in the designated marker file.	
Action	Create marker data.	

No.	Message	Resetting method
308000	could not find current technique (, ,)	E
Cause	The current CTQ file is missing.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
308121	No Calculation Tang (U Signal) (, ,)	C
Cause	The system has failed to detect the rising edge of the U-phase signal during torque angle calculation.	
Action	Measure the torque angle once again. If the same alarm occurs, confirm the magnetic pole sensor signal.	
308122	No Calculation Tang (Z Signal) (, ,)	C
Cause	The system has failed to detect the rising edge of the Z-phase signal during torque angle calculation.	
Action	Measure the torque angle once again. If the same alarm occurs, confirm the encoder signal.	
308311	Could not open markerfile (, ,)	E
Cause	The specified marker file does not exist or is damaged.	
Action	Check the file.	
308312	Marker file empty (, ,)	E
Cause	Data is missing in the designated marker file.	
Action	Create marker data.	
308500	Update program has failed (, ,)	C
Cause	The program monitor cannot be updated properly. A system error is occurring.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
308502	restart block not found (, ,)	C
Cause	The block designated as restart position does not exist.	
Action	Reconfirm from where the program is to be restarted, and then execute the restarting command.	
308550	Now analyzing password (, ,)	E
Cause	The password was entered again when the NC unit was executing password analysis.	
Action	Wait for about 20 seconds, and then if necessary, re-enter the password.	
308560	Parameter was damaged. please restore (, ,)	C
Cause	Power has been turned off during file writing onto the hard disk by the NC software or the OS, so the file has been damaged.	
Action	Press the Restore Parameters button in the version screen.	
308561	Backup parameter copy failed. it is HD exchange (, ,)	A
Cause	The backup area is damaged.	
Action	The hard disk requires replacement. Contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
308700	beam offset out of synchronous area (, ,)	E
Cause	The U-axis is not present in its synchronizing area.	
Action	Move the U-axis to the synchronizing area.	
309000	To merge sub program is failed. (, ,)	E
Cause	The subprogram does not exist or the O number of the subprogram is wrong.	
Action	Prepare a subprogram of the correct O number.	
309001	Sub program file is not found. (, ,)	C
Cause	The specified block has not been found.	
Action	Confirm the specified block.	
309002	Could not save complete text file (CNCpro.cnc). (, ,)	E
Cause	The system has failed to save the combination of files. A system error is occurring.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
309003	Sub program file number is different from O number in text. (, ,)	E
Cause	The O number of the subprogram is wrong.	
Action	Correct the O number to the name of the file concerned.	
309100	userpasswd file write failed. (, ,)	E
Cause	The system has failed to save data in the file corresponding to the entered password.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
309101	userpasswd file read failed. (, ,)	E
Cause	The system has failed to read out the file corresponding to the entered password.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
309102	Authentication of current password failed. (, ,)	E
Cause	The system has failed to authenticate the current password.	
Action	Enter the current password accurately.	
309103	Authentication of new password failed. (, ,)	E
Cause	The system has failed to authenticate the new password.	
Action	Enter the new password accurately.	
309104	Password have to be less than 20 characters. (, ,)	E
Cause	The number of characters in the password is in excess of 20 characters.	
Action	Enter the correct password consisting of 20 characters or less.	

No.	Message	Resetting method
309105	Input current password. (, ,)	E
Cause	The current password is not entered.	
Action	Enter the current password.	
309106	Input new password. (, ,)	E
Cause	A new password is not entered.	
Action	Enter a new password.	
309150	Backup failure. (, ,)	E
Cause	Parameter saving in the backup area has failed.	
Action	Re-execute the saving operation. If the same alarm recurs, contact Mazak Technical Center or Technology Center.	
309200	During auto processing (, ,)	E
Cause	Parameter loading has been attempted during automatic operation.	
Action	Load the parameters after automatic operation has been completed.	
310020	Could not read macro valiable (#800-#812) (, ,)	E
Cause	During NC start, the system has failed to load the macro variables (#800-#812) saved in the storage area.	
Action		
310500	Updating mode (, ,)	—
Cause	The system is in version-upgrading mode.	
Action	In version upgrading mode, since the machine is in an emergency stop status, the machine cannot be operated and the screen display cannot be changed, either. After version upgrading has ended, power off the NC unit and then power it back on.	
310501	File is not selected. (, ,)	C
Cause	A file is not selected.	
Action	Before executing version upgrading, select a file from the software whose version is to be upgraded.	
310503	File name is invalid. (, ,)	C
Cause	The file name is not correct.	
Action	Recheck whether the file that has been selected for version upgrading is correct.	
310504	File is invalid. (, ,)	C
Cause	The file contents are not correct.	
Action	The contents of the file which has been selected for version upgrading are not correct. Recheck whether the file name is correct and whether the file is free of damage.	

No.	Message	Resetting method
310505	File is not selected. (, ,)	C
Cause	A file is not selected.	
Action	Select the file of the software to be used for version upgrading.	
310506	Module is not selected. (, ,)	C
Cause	A module is not selected.	
Action	Select which CPU is to be upgraded in version number.	
310507	Selected file is mismatch. (, ,)	C
Cause	The selected file does not match the CPU in which the version is going to be upgraded.	
Action	A sequencer file is likely to have been selected for servo CPU version upgrading, or vice versa. Recheck.	
310508	Flash memory writing program is invalid (, ,)	C
Cause	The [SH2_UMOD.MOT] file cannot be unfolded.	
Action	The version upgrading software for the servo or sequencer CPU is incorrect. Contact Mazak Technical Center or Technology Center.	
310509	Software file is invalid. (, ,)	C
Cause	The selected file cannot be unfolded.	
Action	The file of the software to be used for version upgrading is incorrect. Recheck for damage to the file.	
310510	Failed to create temporary data file. (, ,)	C
Cause	An error has occurred during the creation of the temporary file.	
Action	The system has failed to create the working area for version upgrading. Contact Mazak Technical Center or Technology Center.	
310511	Failed to transmit data. (, ,)	C
Cause	An error has occurred during data transfer.	
Action	Contact Mazak Technical Center or Technology Center.	
310512	Compare error. (, ,)	C
Cause	An error has occurred during comparison.	
Action	Contact Mazak Technical Center or Technology Center.	
310513	Can not open [SH2_UMOD.MOT] file. (, ,)	C
Cause	The [SH2_UMOD.MOT] file cannot be opened.	
Action	The version upgrading software for the servo or sequencer CPU is incorrect. Contact Mazak Technical Center or Technology Center.	
310514	Can not open selected file. (, ,)	C
Cause	The selected file cannot be opened.	
Action	The file of the software to be used for version upgrading is incorrect. Recheck for damage to the file.	

No.	Message	Resetting method
310515	Failed to create SeqSwitch file. (, ,)	C
Cause	The system has failed to create a sequencer switch file.	
Action	Creation of internal data has failed. Contact Mazak Technical Center or Technology Center.	
310516	Failed to connect USB memory. (, ,)	C
Cause	Connection to the USB memory has failed.	
Action	Accessing the USB memory for version upgrading has failed. Remove the USB memory from the connector and then reconnect the memory. If the alarm occurs even so, use a different USB memory.	
310517	Turn off resonator and press EMG button before updating (, ,)	C
Cause	Enter an emergency stop command to change the mode to version upgrading.	
Action	The machine must be in an emergency stop status before the mode can be changed to version upgrading. Press the emergency stop button after stopping laser operation.	
311001	Could not open markerfile (, ,)	E
Cause	The specified marker file does not exist or is damaged.	
Action	Check the file.	
311002	Marker file empty (, ,)	E
Cause	Data is missing in the designated marker file.	
Action	Create marker data.	
311011	Could not open eiafile (, ,)	E
Cause	The EIA file does not exist.	
Action	Create the EIA file.	
311012	Eia file empty (, ,)	E
Cause	Data is missing in the designated EIA file.	
Action	Create the EIA file.	
311020	Could not read ctq data (, ,)	E
Cause	The CTQ file is not correct.	
Action	The base file of CTQ requires modification. Contact Mazak Technical Center or Technology Center.	
311030	Could not read text buffer correctory (, ,)	E
Cause	The system has failed to properly read the program being edited.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
311040	Marker program is not correct format. (, ,)	E
Cause	The marker program contains syntax errors.	
Action	Correct the program.	

No.	Message	Resetting method
311041	Template marker code is not correct format. (, ,)	E
Cause	The marker program contains template errors.	
Action	Modify the template section of the program.	
311042	Marker code headder is not correct format. (, ,)	E
Cause	The header of the marker program is wrong.	
Action	Modify the header of the program.	
311043	Ctq file is not correct format. (, ,)	E
Cause	The CTQ file is not correct.	
Action	The base file of CTQ requires modification. Contact Mazak Technical Center or Technology Center.	
311050	Marker sub program failed (, ,)	E
Cause	The subprogram does not exist or is damaged.	
Action	Correct the program. Confirm whether the subprogram exists.	
311101	Could not open markerfile (, ,)	E
Cause	The specified marker file does not exist or is damaged.	
Action	Check the file.	
311102	Marker file empty (, ,)	E
Cause	Data is missing in the designated marker file.	
Action	Create the marker data.	
311106	Could not open marker sub file (, ,)	E
Cause	The specified marker subfile does not exist or is damaged.	
Action	Check the marker subfile.	
311107	Mmarker sub file empty (, ,)	E
Cause	Data is missing in the designated marker subfile.	
Action	Create marker subdata.	
311111	Could not open eiafile. (, ,)	E
Cause	The EIA file does not exist.	
Action	Create the EIA file.	
311112	Eia file empty (, ,)	E
Cause	Data is missing in the designated EIA file.	
Action	Create the EIA file.	

No.	Message	Resetting method
311116	Could not read new file data, can not edit (, ,)	E
Cause	The new program cannot be read using the editor.	
Action	Create the correct program to be loaded.	
311117	Could not read select file data, can not edit (, ,)	E
Cause	The selected program cannot be read using the editor.	
Action	Select the correct program.	
311118	Could not read current file data, can not edit (, ,)	E
Cause	The current program cannot be read using the editor.	
Action	Select the correct program.	
311120	memory allocation error (, ,)	E
Cause	The system has failed to reserve the necessary memory location.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
311121	file system error (, ,)	E
Cause	An error has occurred in the file system.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
311122	Could not make system directory (, ,)	E
Cause	The system has failed to create the system folder.	
Action	Turn main power off and then turn it back on. If the same alarm is redisplayed even so, please contact Mazak Technical Center or Technology Center.	
311130	Could not find EOR code (, ,)	E
Cause	An end-of-file code is missing.	
Action	Correct the program.	
311131	Could not find M30 code. (, ,)	E
Cause	An end-of-program code is missing.	
Action	Correct the program.	
311160	Program file is protected (, ,)	E
Cause	You have attempted editing a write-protected program.	
Action	Clear the message by pressing the clear key.	
311200	Marker codes program is not correct format. (, ,)	E
Cause	The marker program contains syntax errors.	
Action	Correct the program.	

No.	Message	Resetting method
311211	To update ctq file is failed (, ,)	E
Cause	The system has failed to update CTQ.	
Action	Confirm whether the CTQ file exists.	
311230	No text in marker program (, ,)	E
Cause	The required data is missing in the marker program.	
Action	Correct the program.	
311231	Marker code program syntax error (, ,)	E
Cause	The marker program contains syntax errors.	
Action	Correct the marker code.	
311241	Can not edit foreground during running (, ,)	E
Cause	Program editing has been attempted during automatic operation.	
Action	Clear the message by pressing the clear key.	
311242	Can not preview during running (, ,)	E
Cause	Marker program conversion has been attempted during automatic operation.	
Action	Clear the message by pressing the clear key.	
311243	Can not edit foregorund in MDI mode (, ,)	E
Cause	Foreground program editing has been attempted in MDI mode.	
Action	Clear the message by pressing the clear key.	
311250	Could not save program correctory (, ,)	E
Cause	The system has failed to save the program in the file. The system has failed to transfer the program to the CNC unit.	
Action	If re-execution results in the same alarm occurring, contact Mazak Technical Center or Technology Center.	
311251	Could not write program to file (, ,)	E
Cause	The file is damaged.	
Action	Delete the file and then save the program in a normal file. If the same alarm recurs, contact Mazak Technical Center or Technology Center.	
311252	Saving program (, ,)	E
Cause	The system is now saving the program.	
Action	Wait for program saving to be completed.	
311261	Could not open complete markerfile (, ,)	E
Cause	The combined marker file does not exist or is damaged.	
Action	Check the combined marker file.	

No.	Message	Resetting method
311262	Complete marker file empty (, ,)	E
Cause	The specified marker file contains no data.	
Action	Create marker data.	
311300	marker program codes syntax error (, ,)	E
Cause	The marker program contains syntax errors.	
Action	Correct the marker code.	
311400	Marker code block syntax error (, ,)	E
Cause	The marker code block contains syntax errors.	
Action	Correct the marker code.	
311401	No flag in a marker block (, ,)	E
Cause	The flag value of the marker code is not correct.	
Action	Correct the marker code.	
311410	ATC flag conversion is failed (, ,)	E
Cause	The ATC marker code is not correct.	
Action	Correct the marker code.	
311411	Lens sellection is not correct in ctq. (, ,)	E
Cause	A torch is not properly selected for the machining conditions.	
Action	Modify the machining conditions.	
311412	Nozzle sellection is not correct in ctq. (, ,)	E
Cause	A nozzle is not properly selected for the machining conditions.	
Action	Modify the machining conditions.	
311413	Start flag conversion is failed (, ,)	E
Cause	The starting marker code is not correct.	
Action	Correct the marker code.	
311414	End flag conversion is failed (, ,)	E
Cause	The ending marker code is not correct.	
Action	Correct the marker code.	
311415	Position flag conversion is failed (, ,)	E
Cause	The position marker flag is not correct.	
Action	Correct the marker code.	

No.	Message	Resetting method
311420	Torch you selected is not in station (, ,)	E
Cause	The designated torch is missing in the tool data.	
Action	Confirm the registered torches.	
311421	Nozzle you selected is not in station (, ,)	E
Cause	The designated nozzle is missing in the tool data.	
Action	Confirm the registered nozzles.	
311422	No piercing condition of tool you selected (, ,)	E
Cause	The piercing conditions for the designated tool are not contained in machining condition data.	
Action	Create machining conditions. Confirm whether the specified tool is correct.	
311423	No cutting condition of tool you selected (, ,)	E
Cause	The cutting conditions for the designated tool are not contained in machining condition data.	
Action	Create machining conditions. Confirm whether the specified tool is correct.	
311430	Piercing type is out of range (, ,)	E
Cause	The piercing type marker is out of range.	
Action	Correct the marker code.	
311431	Cutting type is out of range (, ,)	E
Cause	The cutting type marker is out of range.	
Action	Correct the marker code.	
311432	Cutting end type is out of range (, ,)	E
Cause	The end-of-cutting type marker is out of range.	
Action	Correct the marker code.	
311433	Quality type is out of range (, ,)	E
Cause	The quality marker is out of range.	
Action	Correct the marker code.	
311434	Speed is out of range (, ,)	E
Cause	The speed marker is out of range.	
Action	Correct the marker code.	
311461	Marker sub program file is not found. (, ,)	E
Cause	A marker subprogram file is missing.	
Action	Create the subprogram file.	

No.	Message	Resetting method
316000	Time to maintenance has already passed. (, ,)	C
Cause	The preset time for maintenance has passed.	
Action	Some of the maintenance items have expired very much in terms of the required maintenance time. Conduct maintenance.	
316001	Time to maintenance has already passed. (, ,)	C
Cause	The preset time for maintenance has passed.	
Action	Some of the maintenance items have expired very much in terms of the required maintenance time. Conduct maintenance.	
316002	Time to maintenance has come. (, ,)	C
Cause	The preset time for maintenance has come.	
Action	Some of the maintenance items have reached the required maintenance time. Conduct maintenance.	
316003	Time to maintenance has come. (, ,)	C
Cause	The preset time for maintenance has come.	
Action	Some of the maintenance items have reached the required maintenance time. Conduct maintenance.	
316004	Time to maintenance will come soon. (, ,)	E
Cause	The preset time for maintenance is coming soon.	
Action	Some of the maintenance items have reached 80% of the required maintenance time. Conduct maintenance when the maintenance time is reached.	
316010	Check maintenance information. (, ,)	E
Cause	Confirm maintenance information.	
Action	Some of the maintenance items have reached the required maintenance time. Confirm the display in the maintenance screen and conduct maintenance.	
320000	Failed to make DNC directory (, ,)	C
Cause	The system has failed to create the DNC program transfer destination folder.	
Action	Contact Mazak Technical Center or Technology Center.	
320001	Failed to open COM port (, ,)	C
Cause	Failed to connect to the DNC communication port. The CNC hardware may be faulty.	
Action	Contact Mazak Technical Center or Technology Center.	
320002	Invalid communication parameter (, ,)	C
Cause	The DNC communication parameter is invalid.	
Action	Contact Mazak Technical Center or Technology Center. Check the DNC communication parameter setting.	
320003	Failed to send program (, ,)	C
Cause	Failed to send the DNC program. The CNC hardware may be faulty.	
Action	Contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
320004	Program translation time over (, ,)	C
Cause	Failed to transfer the DNC program because of a timeout. The communication port or the cable may be defective.	
Action	Contact Mazak Technical Center or Technology Center. This problem can be solved in some cases by increasing the value of the system parameter Z240.	
320005	Failed to save program	C
Cause	Failed to save the DNC program. The hard disk may not have any more free space enough.	
Action	Check if there is enough free space in the hard disc and delete unnecessary programs, if any.	
320090	DNC WNo search error (1) (, ,)	C
Cause	Program selection during DNC has failed.	
Action	Execution of the WNo. search during DNC operation has resulted in an error. Execute scheduled operation once again or retry only program transfer in MDI mode. If the problem is not solved even so, contact Mazak Technical Center or Technology Center.	
320091	DNC WNo search error (2) (, ,)	C
Cause	Program selection during DNC has failed.	
Action	Execution of the WNo. search during DNC operation has resulted in an error. Execute scheduled operation once again or retry only program transfer in MDI mode. If the problem is not solved even so, contact Mazak Technical Center or Technology Center.	
320092	DNC WNo search error (1) (, ,)	C
Cause	Program selection during DNC has failed.	
Action	Execution of the WNo. search during DNC operation has resulted in an error. Execute scheduled operation once again or retry only program transfer in MDI mode. If the problem is not solved even so, contact Mazak Technical Center or Technology Center.	
320093	DNC WNo search error (2) (, ,)	C
Cause	Program selection during DNC has failed.	
Action	Execution of the WNo. search during DNC operation has resulted in an error. Execute scheduled operation once again or retry only program transfer in MDI mode. If the problem is not solved even so, contact Mazak Technical Center or Technology Center.	
400400	Gap Command Error (, ,)	C
Cause	The override gap or gap command (G87) value during the execution of the M32 command (Profiling ON) is too large.	
Action	Correct the override gap or the gap command (G87) value to the appropriate value and then restart profiling.	
401210	Trace Voltage Error (No Materials) (, ,)	C
Cause	The Z-axis has stopped before a material was detected in the M32 command (Profiling ON) mode.	
Action	Place the material in the profiling place and restart profiling.	
402171	Servo version is mismatch (, ,)	B
Cause	The combination of the servo and main version numbers is incorrect.	
Action	Confirm the version numbers in the version screen and then report the numbers to Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
402180	Axis is Moving (, ,)	E
Cause	Axis movement is in progress.	
Action	Stop the axis movement before proceeding.	
402181	Reboot CNC to enable modified parameters. (, ,)	E
Cause	Home-position adjustment of the serial encoder has come to normal completion.	
Action	Turn power back on to make effective the parameters that are set up during the home-position adjustment.	
405203	Sequencer version is mismatch (, ,)	B
Cause	The combination of the programmable controller's and main version numbers is incorrect.	
Action	Confirm the version numbers in the version screen and then report the numbers to Mazak Technical Center or Technology Center.	
406100	DNC communication time over (, ,)	C
Cause	Data has not been received within the designated DNC communications time.	
Action	The DNC DI/DO RS-232C communication is not going on properly. Check for cable disconnections, improper connector contact, and other defects. If the problem is not solved even so, contact Mazak Technical Center or Technology Center.	
406101	E-TOWER communication time over (, ,)	C
Cause	Data has not been received within the designated E-TOWER communications time.	
Action	LAN communication with the E-TOWER is not going on properly. Check for cable disconnections, improper connector contact, and other defects. If the problem is not solved even so, contact Mazak Technical Center or Technology Center.	
407000	Laser clamp was exceeded (, ,)	D
Cause	The laser output is in excess of the laser-clamping value.	
Action	Modify the laser output data settings so that they range within clamping data.	

13-3 Alarms Related to the Machine Failure

1. Messages and contents of alarms related to the machine failure

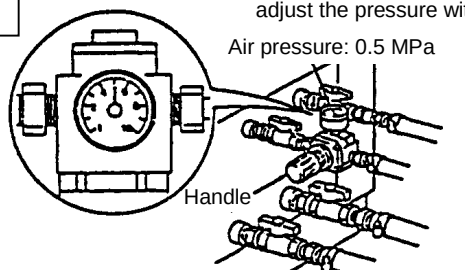
No.	Message	Description
232	LASER ALARM	Not used.
233	LASER SHUTTER ALARM	An abnormality has occurred on the shutter of the oscillator.
234	EMERGENCY STOP	An emergency stop button has been pressed.
235	MAIN AIR PRESSURE DOWN	The main air pressure is abnormal.
236	ASSIST GAS PRESSURE	The assist gas pressure is abnormal.
237	WORK LIFTER ALARM	The worksheet lifter is abnormal.
238	ENCLOSURE COVER ALARM	The sliding cover is abnormal.
239	CHILLER ALARM	The chiller unit is abnormal.
240	STYLUS ALARM	The profiling stylus is abnormal.
241	AUTO GAP CONTROL ALARM	Profiling is abnormal.
242	BREAKER TRIP	Not used.
243	TOUCH SENSOR STYLUS	Not used.
244	LOADER ALARM	The loader is abnormal.
245	PALLET ALARM	The pallet changer is abnormal.
246	TORCH CLASH ALARM	Not used.
247	WORK CLAMP ALARM	The worksheet clamp is abnormal.
248	SIDE GAUGE ALARM	Not used.
249	He-Ne LASER ALARM	Not used.
250	COVER EDGE LS ALARM	Something has come into contact with the slide cover.
251	CHIP CONVEYER ALARM	The chip conveyor is abnormal.
252	LIGHT BARRIER SENSOR ALARM	The light barrier sensor is abnormal.
253	TRANSFORMER OVERHEAT	The transformer is abnormal.
254	COOLING JACKET OVERHEAT	Not used.
255	TOOL AIR PRESSURE DOWN	Not used.
256	ASSIST GAS REGULATOR ALARM	The assist gas electropneumatic regulator is abnormal.
257	OPERATION PB ERROR	The operating switch is abnormal.
258		Not used.
259	MAGAZINE ALARM	The magazine is abnormal.
260	CCD ALARM	Not used.
261	ATC ALARM	The torch/nozzle changer is abnormal.
262	TAP ALARM	Not used.
263	TABLE ALARM	The table box cover is abnormal.
326	LASER DISCHARGE ALARM	The laser discharge circuit does not work properly.
327	LASER HIGH VOLTAGE ALARM	The laser high voltage circuit does not work properly.
1700	PALLET SERVO AMP ALARM	Not used.
1701	MAGAZINE SERVO AMP ALARM	Not used.
1702	PALLET WORK ALARM	The worksheet on the table is abnormal.
1703	2PC WORK SETTING ALARM	The worksheet on the 2-pallet changer is abnormal.
1704	WORK CHECK SENSOR ALARM	The worksheet check sensor is abnormal.
1705	NOZZLE ALARM	Not used.
1706	TABLE BRUSH ALARM	Not used.
1707	CUTTING FAILURE	Burning or plasma was detected.

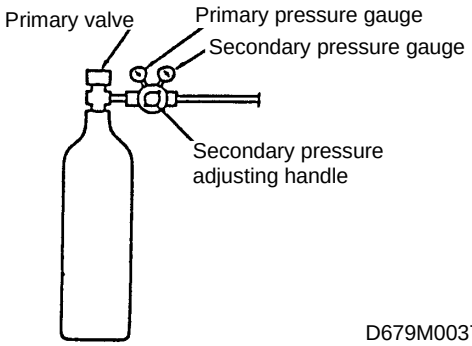
No.	Message	Description
1710	R.D. RELOCATION DETECTED	The machine has been relocated.
1711	R.D. COMMUNICATION ERROR	The relocation detection unit has failed or related wiring is abnormal.
1712	R.D. BATTERY CHANGE TIME EXCEEDED	NC power has been turned off for at least 30 minutes during battery replacement.
1713	R.D. LOW BATTERY	The capacity of the battery has decreased.
1714	R.D. BATTERY NOT MOUNTED	The life of the battery has expired or the battery has been removed.
1715	R.D. PASSWORD ERROR	The password is wrong.
1716	R.D. PASSWORD EXPIRED	The valid term of the password has expired.

Eliminate the cause of the alarm referring to the resetting method below.
Be sure to press the reset key on the operating panel after eliminating the cause of errors. When the message disappears from the screen, the cause has been eliminated. When the message remains on the screen, eliminate the cause while referring to the resetting method.

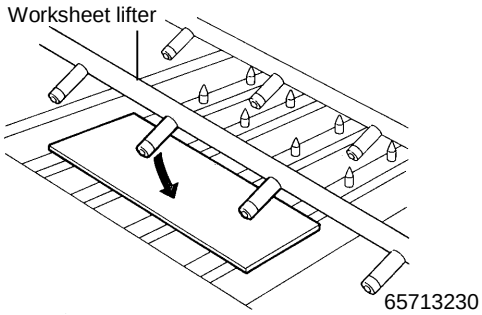
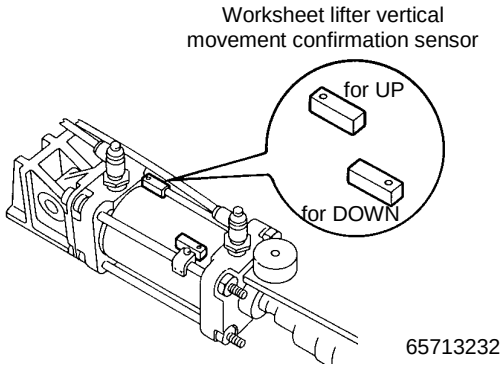
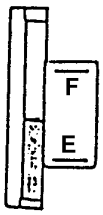
2. Cause and remedy of alarms related to the machine failure

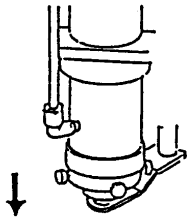
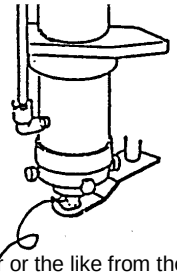
No.	Message	Resetting method
232	LASER ALARM (, ,)	
Cause	Not used.	
Action		
233	LASER SHUTTER ALARM (, ,)	
Cause	1. The laser shutter does not operate. The laser shutter unit is in trouble. 2. The laser shutter operation confirmation sensor is not adjusted properly or is malfunctioning. 3. The laser shutter does not work properly. The oscillator is out of order or the control circuit is defective.	
Action	Contact Mazak Technical Center or Technology Center.	
234	EMERGENCY STOP (, ,)	
Cause	1. The emergency stop button is functioning. 2. The axis has moved out from its predetermined stroke area (hardware OT). 3. A serious abnormality has occurred in the NC unit or the servo system. 4. Control units related to emergency stop have become abnormal.	
Action	1. [1] Turn the emergency stop button in the direction shown by the arrow. [2] Press and hold down the OT release key and reset key at the same time until the emergency stop status has been cleared. [3] Release the OT release key and reset key. [4] Select homing mode and return all axes to the respective home positions by pressing the all-axis homing button. 2. [1] Press and hold down the OT release key and reset key together until the emergency stop has been cleared. [2] Release the reset key with the OT release key held down, then select handle mode, and move the axis that has overtraveled, in the opposite direction. Example: If the X-axis is in a +OT status, rotate the handle in the minus direction while holding down the OT release key. After the axis has moved out from the OT area, release the OT release key. Releasing the OT release key before moving out of the OT range will cause an emergency stop. [3] Select homing mode with the mode selector key and return all axes to the respective home positions by pressing the all-axis homing button on the operating panel. 3. Contact Mazak Technical Center or Technology Center. 4. Contact Mazak Technical Center or Technology Center.	

<table>
<tr><td>No.</td><td>Message</td><td>Resetting method</td></tr>
<tr><td>235</td><td>MAIN AIR PRESSURE DOWN (, ,)</td><td></td></tr>
<tr><td>Cause</td><td colspan="2">The pressure of the supplied air is too low.
The main air pressure confirmation sensor is not adjusted properly or is malfunctioning.</td></tr>
<tr><td>Action</td><td colspan="2">1. Confirm whether the air supplied to the laser machine complies with the specifications.
A pressure of 0.5 MPa and flowrate over 300 L/min (10.6 ft^3/min) (ANR) are required.
2. Confirm whether the indication on the pressure gauge complies with the specifications. If the pressure is below the preset value, perform regulator adjustments for matching to the preset value.
3. Check the air piping for damage.
4. Check the setting of the main air pressure sensor.
5. If the pressure sensor does not work normally, it may be faulty or its cable may be broken.
If any component has broken down, contact Mazak Technical Center or Technology Center.
<table><tr><td>Appropriate value</td><td>0.5 MPa</td></tr></table>
If the appropriate value is not attained, adjust the pressure with the handle.
 

D679M0036</td></tr>
<tr><td>236</td><td>ASSIST GAS PRESSURE (, ,)</td><td></td></tr>
<tr><td>Cause</td><td colspan="2">The pressure of the supplied assist gas is too low.
The assist gas pressure confirmation sensor is not adjusted properly or is malfunctioning.</td></tr>
<tr><td>Action</td><td colspan="2">1. Check the pressure of the assist gas cylinder.
 

D679M0037
2. Check the assist gas piping for damage.
3. Check the setting of the assist gas pressure sensor.
4. If the pressure sensor does not work normally, it may be faulty or its cable may be broken.
If any component has broken down, contact Mazak Technical Center or Technology Center.</td></tr>
</table>

No.	Message	Resetting method
237	WORK LIFTER ALARM (, ,)	
Cause	The worksheet lifter does not operate. The lifter operation confirmation sensor is not adjusted properly or is malfunctioning.	
Action	1. Check the worksheet lifter for clogging objects. 2. Check the air piping for damage. 3. If the solenoid valve does not work normally, it may be faulty or its cable may be broken. 4. Adjust the position of the lifter vertical movement confirmation sensor. 5. If the sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.  65713230  65713232	
238	ENCLOSURE COVER ALARM (, ,)	
Cause	The slide cover does not operate. The cover operation confirmation sensor is not adjusted properly or is malfunctioning.	
Action	1. Check the slide cover for interfering objects. 2. Check the air piping for damage. 3. If the solenoid valve does not work normally, it may be faulty or its cable may be broken. 4. Adjust the position of the cover open/close confirmation sensor. 5. If the sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.	
239	CHILLER ALARM (, ,)	
Cause	The chiller unit is abnormal.	
Action	1. Check whether the amount of cooling water is sufficient or not with the water level gauge attached to the chiller unit. If you replenish cooling water, be sure to turn off the main power prior to doing so. ◆Cooling water level is normal when it is between E and F on the level gauge. 2. If the alarm occurs or an error No. is displayed even when the water amount is sufficient, refer to the operating manual of the chiller unit.  Cooling water level gauge D679M0038	

No.	Message	Resetting method
240	STYLUS ALARM (, ,)	
Cause	The stylus of the profiling device is abnormal.	
Action	1. Check whether or not spatter or the like is attached to the stylus ring and is interfering with the cutting torch. 2. Check whether or not worksheet and the like is interfering with the stylus. 3. If the solenoid valve does not work normally, it may be faulty or its cable may be broken. 4. Adjust the position of the stylus downward stroke end confirmation sensor. 5. Adjust the position of the stylus breakage confirmation sensor. 6. If the sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.  Lower the stylus by M34.  Remove spatter or the like from the stylus. D679M0039	
241	AUTO GAP CONTROL ALARM (, ,)	
Cause	- The nozzle has come into contact with the worksheet. A worksheet has interfered with the operation of the stylus for the contact-type profiling device. - The nozzle has moved past a worksheet-less position. The stylus of the contact-type profiling device falls into laser machined hole. - The profiling calibration has failed. - The coaxial cable for profiling is disconnected. - The profiling-related internal components of the torch are in trouble. - The profiling controller is in trouble.	
Action	1. If any remnants are in contact with the nozzle or the stylus, or spatter or any other foreign material is found on it, remove it. 2. Check to see that the nozzle is not loosened and confirm the nozzle and worksheet states. After fully ensuring safety, machining can be restarted intact by pressing the cycle start button. For example, if the Z-axis moves downward to a position lower than the worksheet, this status is not safe and machining cannot be executed. In such cases, therefore, press the reset key and move the Z-axis to a safe position in cutting feed mode or handle feed mode. If any component has broken down, contact Mazak Technical Center or Technology Center.	
242	BREAKER TRIP (, ,)	
Cause	Not used.	
Action		
243	TOUCH SENSOR STYLUS (, ,)	
Cause	Not used.	
Action		

No.	Message	Resetting method
244	LOADER ALARM (, ,)	
Cause	An error is occurring in the loader system.	
Action	This alarm indicates that the loader system has abnormal. Release the alarm as directed in the manual accompanying the loader system.	
245	PALLET ALARM (, ,)	
Cause	The pallet changer is abnormal.	
Action	1. The pallet changer travelling servoamplifier is abnormal. Refer to the Operating Manual of the servoamplifier to locate the cause of the alarm. 2. The pallet clamp does not operate. The pallet clamp operation confirmation sensor is not adjusted properly or is malfunctioning. 3. The pallet existence confirmation sensor is not adjusted properly or is malfunctioning. If any component has broken down, contact Mazak Technical Center or Technology Center.	
246	TORCH CLASH ALARM (, ,)	
Cause	Not used.	
Action		
247	WORK CLAMP ALARM (, ,)	
Cause	The worksheet clamps do not operate. The worksheet clamp open status confirmation sensor is not adjusted properly or is malfunctioning.	
Action	1. Check the worksheet clamp for clogging objects. 2. Check the air piping for damage. 3. If the solenoid valve does not work normally, it may be faulty or its cable may be broken. 4. Adjust the position of the worksheet clamp open status confirmation sensor. 5. If the sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.	
248	SIDE GAUGE ALARM (, ,)	
Cause	Not used.	
Action		
249	He-Ne LASER ALARM (, ,)	
Cause	Not used.	
Action		
250	COVER EDGE LS ALARM (, ,)	
Cause	Something has come into contact with the slide cover.	
Action	Something has come into contact with the slide cover during the close operation. After stop, the cover returns slowly to the open status automatically. Remove obstructions from the periphery of the slide cover.	

No.	Message	Resetting method
251	CHIP CONVEYER ALARM (, ,)	
Cause	The chip conveyor does not operate.	
Action	1. Remove the chips or other clogging substances. 2. Motor overload has been detected. A thermal relay (circuit protector) has been tripped by an overload. 3. If the chip conveyor does not work normally, it may be faulty. If any component has broken down, contact Mazak Technical Center or Technology Center.	
252	LIGHT BARRIER SENSOR ALARM (, ,)	
Cause	The light-receiving and/or projecting surface of the light barrier sensor is dirty. The light barrier sensor is not adjusted properly or is malfunctioning.	
Action	1. Clean the light-receiving and/or projecting surface of the light barrier sensor. 2. [1] Adjust the optical axis of the light barrier sensor. [2] If the light barrier sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.	
253	TRANSFORMER OVERHEAT (, ,)	
Cause	- The transformer has become overloaded. - The transformer temperature detection sensor is malfunctioning. - The transformer is malfunctioning.	
Action	This alarm occurs when the thermostat in the external power transformer is tripped. Cool the transformer to release this alarm. Turn off the laser machine then allow the transformer to cool. If overheat recurs, change the external transformer installation position so that it can be well ventilated. Also check the ventilation holes in the transformer if they are blocked or not. It is recommended to cool the transformer using a fan. Never splash water to cool the transformer. If any component has broken down, contact Mazak Technical Center or Technology Center.	
254	COOLING JACKET OVERHEAT (, ,)	
Cause	Not used.	
Action		
255	TOOL AIR PRESSURE DOWN (, ,)	
Cause	Not used.	
Action		
256	ASSIST GAS REGULATOR ALARM (, ,)	
Cause	The assist gas electropneumatic regulator is not adjusted properly or is malfunctioning.	
Action	1. Carry out adjustments on the electropneumatic regulator. 2. If the electropneumatic regulator does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.	
257	OPERATION PB ERROR (, ,)	
Cause	Some operations switch or button remains turned on with power on.	
Action	1. The NC power supply is likely to have been turned on with the operations switch or button being held down. 2. The switch or button itself is malfunctioning. If any component has broken down, contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
258	(, ,)	
Cause	Not used.	
Action		
259	MAGAZINE ALARM (, ,)	
Cause	Not used.	
Action		
260	CCD ALARM (, ,)	
Cause	Not used.	
Action		
261	ATC ALARM (, ,)	
Cause	The nozzle changer does not operate. The nozzle changer operation confirmation sensor is not adjusted properly or is malfunctioning.	
Action	1. Check the nozzle changer for clogging objects. 2. Check the air piping for damage. 3. If the solenoid valve does not work normally, it may be faulty or its cable may be broken. 4. Adjust the position of the nozzle clamper pin operation confirmation sensor. 5. If the sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.	
262	TAP ALARM (, ,)	
Cause	Not used.	
Action		
263	TABLE ALARM (, ,)	
Cause	The table box cover does not operate. The table box cover operation confirmation sensor is not adjusted properly or is malfunctioning.	
Action	1. Check the table box cover for interfering objects. 2. Check the air piping for damage. 3. If the solenoid valve does not work normally, it may be faulty or its cable may be broken. 4. Adjust the position of the cover open/close confirmation sensor. 5. If the sensor does not work normally, it may be faulty or its cable may be broken. If any component has broken down, contact Mazak Technical Center or Technology Center.	
326	LASER DISCHARGE ALARM (, ,)	
Cause	The laser discharge circuit does not work properly. The oscillator is out of order or the control circuit is defective.	
Action	Please contact Mazak Technical Center or Technology Center.	
327	LASER HIGH VOLTAGE ALARM (, ,)	
Cause	The laser high voltage circuit does not work properly. The oscillator is out of order or the control circuit is defective.	
Action	Please contact Mazak Technical Center or Technology Center.	

No.	Message	Resetting method
1700	PALLET SERVO AMP ALARM (, ,)	
Cause	Not used.	
Action		
1701	MAGAZINE SERVO AMP ALARM (, ,)	
Cause	Not used.	
Action		
1702	PALLET WORK ALARM (, ,)	
Cause	1. The worksheet is warped. 2. The worksheet has jumped up.	
Action	1. Replace the worksheet with a flat one. 2. Set the worksheet again.	
1703	2PC WORK SETTING ALARM (, ,)	
Cause	1. The worksheet is warped. 2. The worksheet has jumped up.	
Action	1. Replace the worksheet with a flat one. 2. Set the worksheet again.	
1704	WORK CHECK SENSOR ALARM (, ,)	
Cause	The worksheet check sensor is abnormal.	
Action	The worksheet check sensor is malfunctioning. If any component has broken down, contact Mazak Technical Center or Technology Center.	
1705	NOZZLE ALARM (, ,)	
Cause	Not used.	
Action		
1706	TABLE BRUSH ALARM (, ,)	
Cause	Not used.	
Action		

No.	Message	Resetting method
1707	CUTTING FAILURE (, ,)	D
Cause	Burning or plasma was detected.	
Action	Follow the steps below to solve the problem. (1) In the **INTELLIGENT PARAMETER** window, set **Value** for **Burning Detection** and **Plasma Detection** to 0. (2) Check and perform the following. - Check the lens for dirt and clean it if it is dirty. - If spatter or any other foreign material is found on the lens, remove it. - If the nozzle is off center, adjust its position. - Measure the focal length manually or automatically and set it again. (3) Carry out machining again, and when it becomes possible to perform cutting normally, set **Value** for **Burning Detection** and **Plasma Detection** to 1 in the **INTELLIGENT PARAMETER** window and restart machining. If this alarm persists even though the above action was taken, go to Step (4). (4) Reduce the sensitivity of the detection of burning and plasma, and then set **Value** for **Burning Detection** and **Plasma Detection** to 1 in the **INTELLIGENT PARAMETER** window and restart machining. (For an explanation of how to set the sensitivity, see Subsections 6-2-5 and 6-3-5 of the Operating Manual for the Intelligent Loop System.)	
1710	R.D. RELOCATION DETECTED (, ,)	
Cause	The machine has been relocated.	
Action	Contact Mazak Technical Center or Technology Center.	
1711	R.D. COMMUNICATION ERROR (, ,)	
Cause	The relocation detection unit has failed or related wiring is abnormal.	
Action	Contact Mazak Technical Center or Technology Center.	
1712	R.D. BATTERY CHANGE TIME EXCEEDED (, ,)	
Cause	NC power has been turned off for at least 30 minutes during battery replacement.	
Action	Contact Mazak Technical Center or Technology Center.	
1713	R.D. LOW BATTERY (, ,)	
Cause	The capacity of the battery has decreased.	
Action	Replace the battery with a replacement one available from Mazak Technical Center or Technology Center.	
1714	R.D. BATTERY NOT MOUNTED (, ,)	
Cause	The life of the battery has expired or the battery has been removed.	
Action	Contact Mazak Technical Center or Technology Center.	
1715	R.D. PASSWORD ERROR (, ,)	
Cause	The password is wrong.	
Action	Enter the correct password.	
1716	R.D. PASSWORD EXPIRED (, ,)	
Cause	The valid term of the password has expired.	
Action	Apply for a new password.	

13-4 Alarms Related to the Misoperations

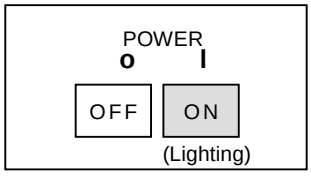
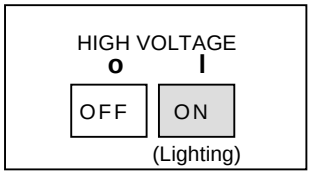
1. Messages and contents of alarms related to the misoperations

No.	Message	Description
264	NOT ZERO RETURN	Manual homing of all axes is not completed.
265	NOT WORK CLAMP CLOSE	The worksheet clamp is not closed.
266	NOT LASER READY	The laser oscillator is not ready for operation.
267	NOT WORK LIFTER DOWN	The worksheet lifter is not at its downward position
268	NOT ENCLOSURE COVER CLOSE	The manual/automatic opening/closing protective cover (Class 1) or the door of the machine is not closed.
269	NOT MAINTENANCE COVER CLOSE	Not used.
270	NOT TOUCH SENSOR UP	Not used.
271	NOT PALLET READY	The pallet changer is not ready for operation.
272	NOT SIDE GAUGE DOWN	The side gauge is not at its downward position.
273	REMOTE CONTROL	Remote control has been activated.
274	IMPROPER M CODE	The M-code is incorrect.
275	PALLET LIGHT BARRIER	The pallet light barrier has been intercepted.
276	AXIS STROKE 2 SELECT	The strokes of the ATC area are effective.
277	TORCH REMOVE	The torch removal switch is on.
278	NOT AUTO FOCUS AJUST	Automatic focus adjustment is not completed.
279	MACHINE SETUP OFF	The setup switch is off.
280	NOT PERMISSION PB	The permission button is off.
281	MACHINE SETUP ON	The setup switch is on.
282	NOT TRACER CALIBRATION	Profiling calibration is not completed.
283	DIRT OF AIR FILTER	The main air filter is clogged.
284	LIGHT BARRIER	The light barrier has been intercepted.
285	IMPROPER LOADER M CODE	M-code for loader operation cannot be executed.
286	NOT CHIP CONVEYER READY	The chip conveyor is inactive.
287	NOT LASER AREA	The axis is in the laser prohibited area.
289	LUBRICATOR OIL LEVEL DOWN	Lubrication oil is not supplied.
290	GAP ADJUST MODE	The profiling adjustment mode of the NC unit is on.
292	NOZZLE DEFECT	Not used.
293	CHAMFERING OIL LEVEL DOWN	Not used.
294	CHIP CONVEYER LUBRICATION	Not used.
295	TAP MAINTENANCE MODE	The tap maintenance mode is on.
1709	EXAUST UNIT ALARM	The dust collector is abnormal.
1732	TORCH MISMATCH	Not used.
1733	IMPROPER T CODE	The T-code is incorrect.
1734	NOT MAGAZINE READY	Not used.
1735	NOT MAGAZINE DOOR CLOSE	Not used.
1736	TRACER MISMATCH	Not used.
1737	NOT WORK CLAMP OPEN	Not used.
1738	AUTO WORK CLAMP RETREAT	Not used.
1739	NOT ONLINE READY	Not used.
1740	NOT LOCATOR READY	Not used.
1741	NOT TORCH COVER CLOSE	Not used.
1742	TABLE BOX AREA	The axis is within the table box area.
1743	SAFETY FENCE OPEN	The safety fence is not closed.

Eliminate the cause of the alarm referring to the resetting method below.

Be sure to press the reset key on the operating panel after eliminating the cause of errors. When the message disappears from the screen, the cause has been eliminated. When the message remains on the screen, eliminate the cause while referring to the resetting method.

2. Cause and remedy of alarms related to the misoperations

No.	Message	Resetting method
264	NOT ZERO RETURN (, ,)	
Cause	No manual all-axis homing operations have been performed since NC power was turned on or an emergency stop released.	
Action	Select homing mode and perform the homing operations by pressing the all-axis homing button.	
265	NOT WORK CLAMP CLOSE (, ,)	
Cause	The worksheet clamp is not closed.	
Action	Close the worksheet clamps.	
266	NOT LASER READY (, ,)	
Cause	1. The high voltage of the laser oscillator has not been switched on. 2. During cutting (laser shutter being open, discharge ON), the high voltage has been turned off.	
Action	1. Wait till the lamps of the POWER and HIGH VOLTAGE button light up. 2. During cutting (laser shutter being open, discharge ON), the high voltage of the laser oscillator has been turned off. If any component has broken down, contact Mazak Technical Center or Technology Center.  	
267	NOT WORK LIFTER DOWN (, ,)	
Cause	The worksheet lifter is not at its downward position.	
Action	Move the worksheet lifter downward.	
268	NOT ENCLOSURE COVER CLOSE (, ,)	
Cause	The manual/automatic opening/closing protective cover (Class 1) or the door of the machine is not closed.	
Action	Close the manual/automatic opening/closing protective cover (Class 1) or the door.	
269	NOT MAINTENANCE COVER CLOSE (, ,)	
Cause	Not used.	
Action		
270	NOT TOUCH SENSOR UP (, ,)	
Cause	Not used.	
Action		

No.	Message	Resetting method
271	NOT PALLET READY (, ,)	
Cause	The palette changer is not yet ready for operation.	
Action	Satisfy conditions mentioned below and execute the pallet change operation: 1. The machine is not in the emergency stop state or the alarm state. 2. All the axes are at their zero points. 3. No laser beam is emitted (laser shutter closed). 4. The switches on the 2-pallet changer operating penel are in the following positions: Automatic mode is selected. The setup switch is set to **O**. The work set button is turned ON. 5. The light barrier is not activating. 6. The worksheet clamps are closed. 7. Pallets are placed on the laser machine side and the 2-pallet changer side, one on each side, and they are clamped securely. (The pallet 1 or pallet 2 LED lamp is lit.) 8. The 2-palette changer is in the uppermost or lowermost position. (The Down or Up button LED is lit.) 9. The drive chain of the 2-pallet changer is in the standby position on the laser machine side. (The Forward LED is lit.)	
272	NOT SIDE GAUGE DOWN (, ,)	
Cause	The side gauge is not at its downward position.	
Action	Move the side gauge downward.	
273	REMOTE CONTROL (, ,)	
Cause	No remote control terminals are short-circuited.	
Action	1. Check if “68” and “P24N” of XTB9 on the electrical control panel are short-circuited. 2. In the case where the remote control connector is used for the barrier interlock, emergency stop or others, check if there is any disconnected wiring or faulty switch contact between them.	
274	IMPROPER M CODE (, ,)	
Cause	An M-code with no assigned function is used. An M-code for optional function that has not added is used.	
Action	Correct the program.	
275	PALLET LIGHT BARRIER (, ,)	
Cause	The light barrier on the periphery of the pallet changer has been intercepted.	
Action	Remove the object that has intercepted the light barrier.	
276	AXIS STROKE 2 SELECT (, ,)	
Cause	The axis stroke-2 selector button is on.	
Action	Turn stroke 2 off with the axis stroke-2 selector button.	
277	TORCH REMOVE (, ,)	
Cause	The torch removal switch is on.	
Action	Turn off the torch removal switch.	

No.	Message	Resetting method
278	NOT AUTO FOCUS AJUST (, ,)	
Cause	Automatic focus adjustment is not completed.	
Action	Conduct the automatic focus adjustment to completion.	
279	MACHINE SETUP OFF (, ,)	
Cause	The machine setup switch is set to "**O**" (invalid).	
Action	Set the machine setup switch to the position "**I**" (valid).	
280	NOT PERMISSION PB (, ,)	
Cause	The permission button is off.	
Action	The operation should be performed with both hands, simultaneously with the operation of the permission button. Perform the operations while keeping the permission button on.	
281	MACHINE SETUP ON (, ,)	
Cause	The machine setup switch is set to "**I**" (valid).	
Action	Set the machine setup switch to the position "**O**" (invalid).	
282	NOT TRACER CALIBRATION (, ,)	
Cause	Profiling calibration is not completed.	
Action	Conduct profiling calibration to completion.	
283	DIRT OF AIR FILTER (, ,)	
Cause	The air filter element is clogged because of the intrusion of foreign material or oil into the air filter.	
Action	Change the old filter element with a new one.	
284	LIGHT BARRIER (, ,)	
Cause	The light barrier (photoelectric sensor) on the periphery of the machine table has been intercepted.	
Action	Remove the object that has intercepted the light barrier.	
285	IMPROPER LOADER M CODE (, ,)	
Cause	The loader command has been entered when laser beam was being emitted.	
Action	Correct the program.	
286	NOT CHIP CONVEYER READY (, ,)	
Cause	The chip conveyor is inactive.	
Action	Turn on the chip conveyor.	
287	NOT LASER AREA (, ,)	
Cause	The axis is in the laser prohibited area.	
Action	Move the axis out from the laser prohibited area.	

No.	Message	Resetting method
289	LUBRICATOR OIL LEVEL DOWN (, ,)	
Cause	1. The oil in the lubrication unit has been reduced to a low level. 2. The lubrication oil supply pressure has fallen.	
Action	1. Add oil to the lubrication unit. After the addition of oil, press the reset or clear (CAN) key to clear the alarm. 2. [1] If the lubrication motor is not running, the unit may be faulty. [2] Check if the piping is clogged. [3] The pressure sensor or the oil level sensor may be faulty. If any component has broken down, contact Mazak Technical Center or Technology Center.	
290	GAP ADJUST MODE (, ,)	
Cause	The profiling adjustment mode of the NC unit is on.	
Action	Turn off the profiling adjustment mode of the NC unit.	
292	NOZZLE DEFECT (, ,)	
Cause	Not used.	
Action		
293	CHAMFERING OIL LEVEL DOWN (, ,)	
Cause	Not used.	
Action		
294	CHIP CONVEYER LUBRICATION (, ,)	
Cause	Not used.	
Action		
295	TAP MAINTENANCE MODE (, ,)	
Cause	The tap maintenance mode is on.	
Action	Turn off the tap maintenance mode.	
1709	EXAUST UNIT ALARM (, ,)	
Cause	The dust collector is abnormal.	
Action	Eliminate the cause of the alarm referring to the instruction manual accompanying the dust collector.	
1732	TORCH MISMATCH (, ,)	
Cause	Not used.	
Action		
1733	IMPROPER T CODE (, ,)	
Cause	1. The specifiable T-code range is overstepped. 2. The function concerned does not allow the use of T-codes.	
Action	Correct the program.	

No.	Message	Resetting method
1734	NOT MAGAZINE READY (, ,)	
Cause	Not used.	
Action		
1735	NOT MAGAZINE DOOR CLOSE (, ,)	
Cause	Not used.	
Action		
1736	TRACER MISMATCH (, ,)	
Cause	Not used.	
Action		
1737	NOT WORK CLAMP OPEN (, ,)	
Cause	Not used.	
Action		
1738	AUTO WORK CLAMP RETREAT (, ,)	
Cause	Not used.	
Action		
1739	NOT ONLINE READY (, ,)	
Cause	Not used.	
Action		
1740	NOT LOCATOR READY (, ,)	
Cause	Not used.	
Action		
1741	NOT TORCH COVER CLOSE (, ,)	
Cause	Not used.	
Action		
1742	TABLE BOX AREA (, ,)	
Cause	The axis is within the table box area.	
Action	Move the axis out of the table box area.	
1743	SAFETY FENCE OPEN (, ,)	
Cause	The safety fence is not closed.	
Action	Close the safety fence.	

13-5 Alarms Related to the Laser Machine Errors

1. Messages and oscillator numbers of alarms related to the oscillator failure

No.	Alarm message (on the NC operating panel)	Related alarm No. (on the oscillator)
296	LASER GAS PS LOW	Oscillator alarm No. 11
297	LASER OCR/CB TRIP	Oscillator alarm No. 12, 13, 14
298	LASER T/B COOLING WATER LOW	Oscillator alarm No. 32
299	LASER H/V PANEL OPEN	Oscillator alarm No. 18
300	LASER T/B ALARM	Oscillator alarm No. 17, 21, 22, 23, 24, 25 26, 27, 28
301	LASER SHUTTER ALARM	Oscillator alarm No. 31, 33
302	LASER BEND BLOCK TEMP HIGH	Oscillator alarm No. 34
303	LASER RESONATOR PS ALARM	Oscillator alarm No. 36
304	LASER DRY AIR ALARM	Oscillator alarm No. 37, 54
305	LASER SUPPLY VOLTAGE ALARM	Oscillator alarm No. 47, 48
306	LASER H/V UNIT TEMP HIGH	Oscillator alarm No. 41, 42, 43
307	LASER H/V CONTROL ALARM	Oscillator alarm No. 44
308	LASER POWER SENSOR ALARM	Oscillator alarm No. 45
309	LASER POWER LOW	Oscillator alarm No. 46
310	LASER OIL FILTER ALARM	Oscillator alarm No. 51
311	LASER VACUUM ALARM	Oscillator alarm No. 52
312	LASER SHUTTER BOX ALARM	Oscillator alarm No. 53
313	LASER CONTROL UNIT ALARM	Oscillator alarm No. 61, 62

If any of the above alarm messages is displayed on the NC operating panel, check the display unit of the oscillator for displayed alarm number and then remove the cause of the alarm seeing the description of resetting methods on the next page onward.

2. Contents and resetting method of the oscillator alarm numbers

Alarm No.	Title	Contents / Resetting method
11	Gas Cylinder Pressure Too Low	The pressure of the laser gas supplied from the laser gas cylinder has decreased below 0.12 MPa and thus the contact point of the corresponding pressure switch has opened. The laser stops operating as a result.
		- Check the residual volume of gas in the cylinder and, if necessary, replace the cylinder. - Check the residual pressure inside the tank of the gas mixer (if used). - Contact Mazak Technical Center or Technology Center.
12	Vacuum Pump OCR Tripped	An overcurrent has flown into the overcurrent relay (OCR) connected to the magnet switch of the vacuum pump and thus the contact point of the overcurrent relay has opened. The laser stops operating as a result.
		- Check the three-phase 200 V supply voltage. - Contact Mazak Technical Center or Technology Center.
13	High-Voltage CB Tripped	An overcurrent has flown into the power circuit breaker for the high-voltage power unit and thus the alarm contact of the circuit breaker has opened. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.
14	Turbo Blower CB Tripped	An overcurrent has flown into the power circuit breaker for the turbo blower and thus the alarm contact of the circuit breaker has opened. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.
17	Turbo Blower Overheated	The temperature at the inlet of the turbo blower cooling water has increased above 70°C (158°F) due to a shortage of cooling water, for example, and thus the contact point of the corresponding temperature switch has opened. The laser stops operating as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center.
18	High-Voltage Power Unit Panel Open	The panel of the high-voltage power unit was opened and thus the contact point of the corresponding door switch has opened. The laser stops operating as a result.
		- Check if the panel is completely closed or if it has any loose screws. - Contact Mazak Technical Center or Technology Center.
21	Turbo Blower Inverter Overloaded	An overcurrent has flown across the output of the turbo blower inverter or the inverter itself has malfunctioned, and thus the corresponding alarm contact has opened. The laser stops operating as a result.
		- Replace the gas completely. - Check for inappropriate mixture ratio of the laser gas. - Check for leaks in the laser gas pipeline. - Check the three-phase 200 V supply for an open-phase or voltage error. - Contact Mazak Technical Center or Technology Center.
22	Turbo Blower Inverter RPM Too Low	The specified-speed confirmation signal, which closes the corresponding contact point, has not been generated within 100 s of the inverter start, or the contact point was opened in the middle of the inverter operation. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.

Alarm No.	Title	Contents
		Resetting method
23	Turbo Blower Differential Pressure Too Low	The difference in pressure between the discharge section and the motor room of the turbo blower has decreased below 2.66 kPa (normally, discharge pressure – motor room pressure > 2.66 kPa) and thus the corresponding contact point of signal relay has opened. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.
24	Turbo Blower Differential Pressure Too High	The difference in pressure between the discharge section and the motor room of the turbo blower has increased above 11.97 kPa (normally, discharge pressure – motor room pressure < 11.97 kPa) and thus the corresponding contact point of signal relay has opened. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.
25	Turbo Blower No. 1 Motor Overheated	The motor coil temperature and bearing temperature of the No. 1 (output) turbo blower have increased respectively above 150°C (302°F) and 120°C (248°F), and thus the corresponding contact point of signal relay has opened. The laser stops operating as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Check if the oil level of the turbo blower is appropriate. - Contact Mazak Technical Center or Technology Center.
26	Turbo Blower No. 2 Motor Overheated	The motor coil temperature and bearing temperature of the No. 2 (final-stage) turbo blower have increased respectively above 150°C (302°F) and 120°C (248°F), and thus the corresponding contact point of signal relay has opened. The laser stops operating as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Check if the oil level of the turbo blower is appropriate. - Contact Mazak Technical Center or Technology Center.
27	Turbo Blower No. 1 Gas Overheated	The gas temperature at the inlet of the No. 1 (output) turbo blower has increased above 60°C (140°F), or an electrical disconnection or short circuit has occurred on the detection thermistor. The laser stops operating as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center.

Alarm No.	Title	Contents
		Resetting method
28	Turbo Blower No. 2 Gas Overheated	The gas temperature at the inlet of the No. 2 turbo blower has increased above 60°C (140°F), or an electrical disconnection or short circuit has occurred on the detection thermistor. The laser stops operating as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center.
31	Shutter Abnormal	The Open/Close confirmation signal relay contact point of the shutter position detector has not closed within one second of issuance of the corresponding command. The high voltage of the laser is cut off as a result.
		- Contact Mazak Technical Center or Technology Center.
32	Cooling Water Flow Rate Too Low	The flow rate of the shutter cooling water has decreased below 3.5 L/min or 0.124 ft^3/min (ANR) and thus the contact point of the corresponding flow switch has opened. The laser stops operating as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Check the chiller water inlet and outlet for inverse connection. - Contact Mazak Technical Center or Technology Center.
33	Shutter Absorber Overheated	The maximum allowable temperature of some section of the shutter unit has been exceeded to open the contact point of the temperature switch. - Shutter absorber water OUT connector: 60°C (140°F) - Shutter casing: 70°C (158°F) - Shutter mirror support rod: 60°C (140°F) The high voltage of the laser is cut off as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Check the chiller water inlet and outlet for inverse connection. - Contact Mazak Technical Center or Technology Center.
34	Resonator Mirror Overheated	The maximum allowable resonator loopback block temperature of 50°C (122°F) has been exceeded to open the contact point of the temperature switch. The high voltage of the laser is cut off as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center. * This alarm may be displayed upon turning on the machine if the ambient temperature is higher than 50°C (122°F).

Alarm No.	Title	Contents
		Resetting method
36	Discharge Tube Gas Pressure Abnormal	The gas pressure in the discharge tube has overstepped ±10% of the preset value during laser operation. The high voltage of the laser is cut off as a result.
		- Contact Mazak Technical Center or Technology Center.
37	Condensation in Resonator	Condensation on the main flange cooling plate in the resonator has occurred to open the contact point of the corresponding condensation detection switch. The high voltage of the laser is cut off as a result.
		- Check if the oscillator panel is not opened and, if required, close the panel completely to prevent dry air from leaking throuh the clearance. - Check for inappropriate amount of dry air. - Check for moisture in the dry air. - Contact Mazak Technical Center or Technology Center. * This alarm may also imply that the laser has been operated with the oscillator panel remaining open under a high-temperature and high-humidity environment or that the laser or the chiller has been operated with insufficient amount of dry air. In these cases, stop the laser or the chiller and leave them intact for a while with the dry air on.
41	Power Unit Ambient Temperature Too High	The maximum allowable ambient temperature of 70°C (158°F) has been exceeded to open the contact point of the temperature switch located on the control panel. The high voltage of the laser is cut off as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center.
42	High-Voltage Transformer Overheated	The maximum allowable high-voltage transformer casing temperature of 70°C (158°F) has been exceeded to open the contact point of the temperature switch located on the casing. The high voltage of the laser is cut off as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center.
43	High-Voltage Power Unit Overheated	The maximum allowable temperature 70°C (158°F) for the semiconductor cooling fin of the high-voltage power unit has been exceeded to open the contact point of the temperature switch located on the cooling fin. Or the +/–15V signal is not sent from the high-voltage power unit to the main control printed circuit board. The high voltage of the laser is cut off as a result.
		- Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center.

Alarm No.	Title	Contents
		Resetting method
44	High-Voltage Current Control Error	A signal from the high-voltage power unit has not been detected, an overcurrent has flown into the semiconductor of the high-voltage power unit, a shimmer discharge current error has occurred, or the current of the discharge tube has not been detected, and thus the related contact point of signal relay has opened. (Detection of high-voltage leakage) The high voltage of the laser is cut off as a result.
		- Replace the gas completely. This alarm is particularly prone to occur when a laser gas replacement has been made or when the machine is started after shutdown for two days or longer. In these cases, be sure to perform gas replacement. - Check for inappropriate mixture ratio of the laser gas. - Check for leaks in the laser gas pipeline. - Contact Mazak Technical Center or Technology Center.
45	Power Sensor Error	The power monitoring signal voltage has increased above 9.9 V (due to a power sensor cable disconnection). The high voltage of the laser is cut off as a result.
		- Contact Mazak Technical Center or Technology Center.
46	Power Too Low	The power monitoring signal voltage has decreased below 1/3 of its rated output value. The high voltage of the laser is cut off as a result.
		- Check the laser gas cylinder for inappropriate gas mixing ratio. - In case of insufficient gas replacement, replace the gas completely. - In case of insufficient aging, turn high voltage on and perform aging and gas replacement operations. - Check the operation of the chiller (the flow of the cooling water). - Check if the chiller water quantity is appropriate. - Check if the chiller water temperature ranges appropriately from 15 to 20°C (59 to 68°F). - Check if the chiller water pressure has fallen short of the range from 0.34 to 0.44 MPa. - Check the internal strainer of the oscillator for clogging. - Contact Mazak Technical Center or Technology Center. * This alarm may be displayed, without any abnormality, in the following cases: - Tuning or power monitor unit adjustments have not been conducted (during installation or maintenance). - The power button is set to the OFF position and the specified value of laser output is too small (1 to 2 V).
47	Input Power Overvoltage	The 200 VAC supply voltage has increased above 243 V. The laser stops operating as a result.
		- Check the three-phase 200 V supply voltage. - Contact Mazak Technical Center or Technology Center.
48	Input Power Undervoltage	The 200 VAC supply voltage has decreased below 179 V. The laser stops operating as a result.
		- Check the three-phase 200 V supply voltage (for an open phase). - Contact Mazak Technical Center or Technology Center.
51	Oil Mist Filter Clogged	The evacuation at the start of laser operation has not been completed within a predetermined time (15 min). The laser stops operating as a result. Operation comes to an immediate stop without normal shutdown sequence (without atmospheric pressure charging).
		- Contact Mazak Technical Center or Technology Center.

Alarm No.	Title	Contents
		Resetting method
52	Vacuum Leakage Detected	The open/close cycle time of the laser gas supply solenoid valve has deviated significantly (by 180 seconds) from the normal range of 15 to 20 seconds (in some cases, a maximum of about 120 seconds). The high voltage of the laser is cut off as a result.
		- Contact Mazak Technical Center or Technology Center.
53	Shutter Box Position Error	The laser operation has been started without the shutter box having been returned to the normal position (after maintenance). The high voltage of the laser is cut off as a result.
		- Contact Mazak Technical Center or Technology Center.
54	Dry Air Pressure Too Low	The pressure of the dry air supplied to the frame of the laser oscillator has decreased below 0.04 MPa and thus the contact point of the corresponding pressure switch has opened. The laser stops operating as a result.
		- Check for inappropriate amount of dry air. - Check for clogging of the dry air filters (for shutter-connecting hose) in the laser oscillator. If necessary, replace the two filters. - Contact Mazak Technical Center or Technology Center.
61	Machine Model Setting Error	The DIP switch (DPSW) on the main control printed circuit board is not set properly for setting the machine model. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.
62	Control Unit Error	The control of the main control printed circuit board is abnormal. The laser stops operating as a result.
		- Contact Mazak Technical Center or Technology Center.

13-6 POST (Power ON Self-Test) Error in the Personal Computer Block

Personal computer functions are added to Preview. When the personal computer block is powered on, it will conduct self-tests and start the operating system. If any problem occurs during the self-tests, an alarm will be displayed on the screen to indicate that a POST (Power ON Self-Test) error has occurred. The figure below shows the alarm display.

If this alarm occurs, turn power off by setting the main power switch (main power breaker operating handle) to the OFF position, and after turning the main power switch back on, restart the NC unit by pressing the power ON button. If the alarm is not cleared even so, please notify the alarm number and the alarm message to Mazak Technical Center or Technology Center. In the example shown below, the alarm number is **163** and the message is **Date and Time Incorrect**.

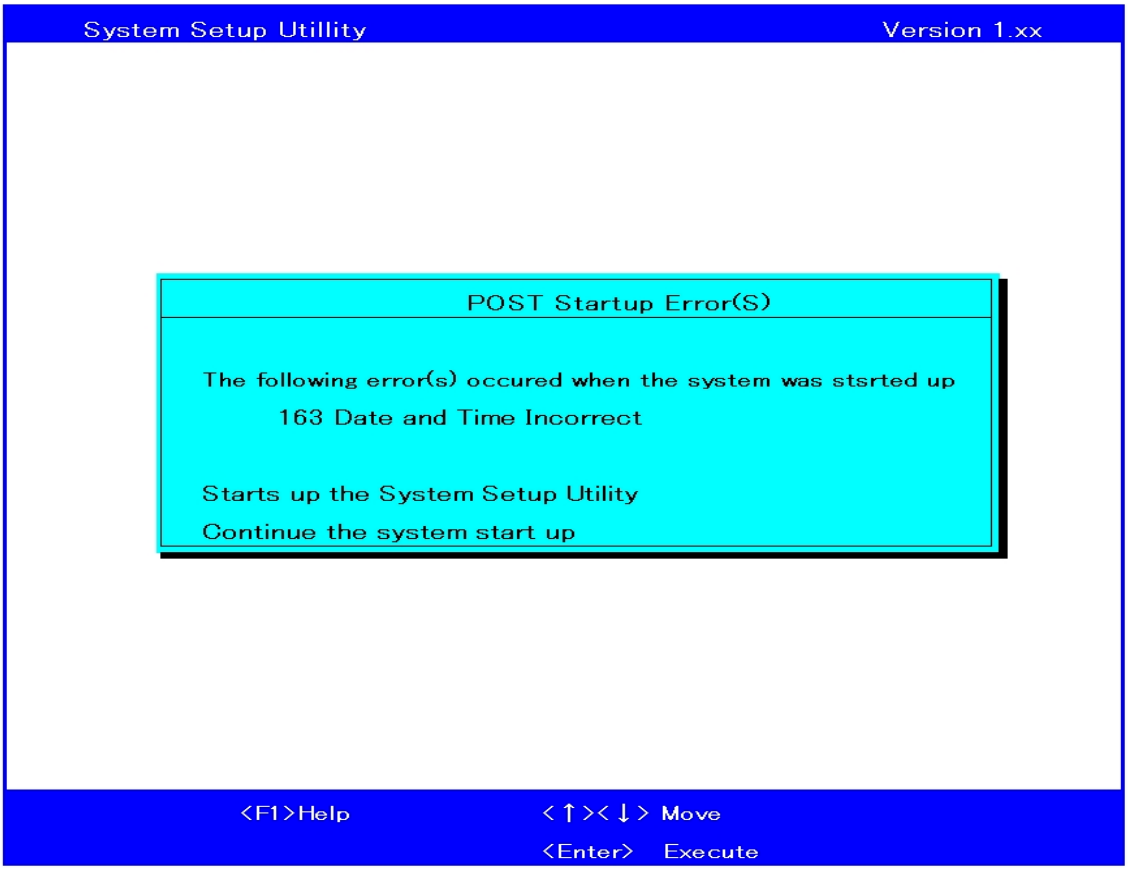


Fig. 13-1 Example of a POST error D676M0302

13-7 Alarms Related to the Macroprogram

1. Message and contents of alarms related to the macroprogram

No.	Message	Contents
1200	TOOL PARAMETER SETTING ERROR	The parameter for setting the number of available tools is not correct.
1201	NOZZLE PARAMETER SETTING ERROR	The parameter for setting the number of available nozzles is not correct.
1202	CURRENT TOOL DATA ERROR	There is an erroneous setting among the tool data items.
1203	CURRENT NOZZLE DATA ERROR	The current nozzle number is not correct.
1204	FOCUS DATA ERROR	The focal length setting on the screen concerned is not correct.
1205	MAGAZINE TOOL SELECT ERROR	The tool selection command does not correspond to the current tooling state of the magazine.
1206	TRACER CALIBRATION ERROR	The Z-coordinate for tracer calibration is not correct.
1207	TRACER SKIP SIGNAL ERROR	The input signal by touching the plate cannot be received appropriately during tracer calibration.
1208	TRACER VOLTAGE ERROR	The voltage for tracer calibration is not correct.
1209	PARAMETER SETTING ERROR	The parameter for setting the number of tracing voltage values to be detected is not correct.
1210	TOOL COMMAND DATA ERROR	Combination of arguments T and Z is not correct.
1211	COMMAND T DATA ERROR	Argument T is not correct.
1212	COMMAND Z DATA ERROR	Argument Z is not correct.
1213	COMMAND W DATA ERROR	Argument W is not correct.
1214	COMMAND J THICKNESS ERROR	Argument J is not correct.
1215	AUTO FOCUS OUT OF RANGE	Argument U for automatic focusing is outside the setting range.
1216	MATERIAL ERROR	Material designation is not adequate.
1217	THICKNESS ERROR	Plate thickness designation is not adequate.
1218	COMMAND Z DATA ERROR	Argument Z is outside the setting range.
1219	MACRO CALL ERROR	An argument in the macroprogram call command is not correct.
1220	LASER DISCHARGE ON	The given command is not compatible with the lasing condition.
1221	TRACE ON	The given command is not compatible with the tracing condition.
1222	ASSIST GAS ON	The given command is not compatible with the assisting-gas supplying condition.
1223	CLEAN LENS.	Lens contamination has been detected.
1224	CHANGE NOZZLE.	The nozzle has been found to be abnormal.
1225	TORCH IS NOT IN HOLDER	The sensor for checking the presence of a torch in the torch holder is malfunctioning.
1226	VALID TORCH IS NOT REGISTERED	No corresponding torch registered is found to be effective (enabled).
1227	VALID NOZZLE IS NOT REGISTERED	No corresponding nozzle registered is found to be effective (enabled).
1228	TORCH IS NOT IN HEAD	The head has no torch mounted.
1229	NOZZLE DOES NOT EXIST	The current torch has no nozzle mounted. Nozzle mounting has failed.
1230	NOZZLE EXIST	The current torch has a nozzle mounted. Nozzle return has failed.
1231	TORCH IS IN HOLDER	The holder to which the torch should be returned has another torch.
1232	TORCH IS IN HEAD	The command for mounting the torch is not executable since the head has another torch mounted.
1233	TORCH IS NOT IN STATION	There is no torch at Station 1 or 2.
1234	HOLDER IS NOT IN STATION	There is no torch holder at Station 1 or 2.
1235	SAME TOOL IS IN HOLDER	Torches of the same type are provided at Station 1 and Station 2. The tool registration on the **TOOL DATA** screen is erroneous.
1236	MAGAZINE NOT CORRECT POSITION	Tool change between machine and magazine is no more possible since the magazine indexing state is abnormal.
1240	NOT CORRECT TOOL	The given command is not compatible with the currently selected tool.
1241	NOT LASER TORCH	The current torch is not a laser torch.
1242	NOT SHAVER TORCH	The current torch cannot execute the shaving function.

No.	Message	Contents
1243	NOT CHAMFER TORCH	The current torch cannot execute the chamfering function.
1244	NOT TAP TORCH	The current torch cannot execute the tapping function.
1250	UPPER BLUE FLAME ISN'T DETECTED	The upper side of the blue flame cannot be detected.
1251	LOWER BLUE FLAME ISN'T DETECTED	The lower side of the blue flame cannot be detected.
1252	BLUE FLAME IS NOT DETECTED	The blue flame cannot be correctly detected.
1253	FOCUS IS OUT OF RANGE	The focus obtained by the blue flame detection is outside the allowable range.
1254	AUTO FOCUS DIST. OUT OF RANGE	The reference distance for the automatic focusing function (#998) is outside the setting range.
1255	FOCUS LENGTH IS OUT OF RANGE	The focal length (#999) is outside the setting range.
1260	CHAMFER DROOP OVER	The error during chamfering operation is excessively great. The chamfering tool has been worn significantly.
1265	TAP COMMAND ERROR	Argument Z (amount of offsetting along the Z-axis) in a tapping command is outside the setting range.
1266	TAP TOOL ERROR	The tapping tool has been found to be broken by the corresponding detection function.
1270	EDGE IS NOT DETECTED	The coordinates of the workpiece corner cannot be detected correctly.
1271	OUT OF ROTATION LIMIT	The obliquity of the workpiece is outside the allowable range.
1272	ROTATION COMMAND ERROR	Argument I, J, K, A, or B in a G192 command is outside the setting range.

2. Cause and remedy of alarms related to the macroprogram

No.	Message	Clearing procedure
1200	TOOL PARAMETER SETTING ERROR (, ,)	D
Cause	The parameter for setting the number of available tools is not correct.	
Action	The maximum number of available tools, or torches, is 4 (or 6 for HG612) for the standard machine, or 20 for machines equipped with a magazine. Consult Mazak Technical Center or Technology Center as to whether or not and how to correct the parameter concerned (**J002**) with reference to the type of the machine in question.	
1201	NOZZLE PARAMETER SETTING ERROR (, ,)	D
Cause	The parameter for setting the number of available nozzles is not correct.	
Action	The maximum number of available nozzles is 10. Consult Mazak Technical Center or Technology Center as to whether or not and how to correct the parameter concerned (**J003**).	
1202	CURRENT TOOL DATA ERROR (, ,)	D
Cause	There is an erroneous setting among the tool data items.	
Action	1. Check the current torch No. on the **TOOL DATA** screen to correct the erroneous setting (smaller than zero [0], or larger than the maximum number of available torches [4 and 6 for the standard machine and particularly for HG612, respectively, or 20 for machines with a magazine]). 2. The function for blue flame detection or lens contamination detection requires the nozzle to have been removed from the torch. Remove the nozzle and change on the **TOOL DATA** screen the current nozzle No. to zero [0] and, if required, the current head status to one [1]. 3. The function for workpiece corner detection requires a nozzle to have been mounted on the torch. Mount a nozzle on the torch and change on the **TOOL DATA** screen the current nozzle No. from zero [0] to the appropriate number (not exceeding the maximum permissible number) and, if required, the current head status to two [2].	
1203	CURRENT NOZZLE DATA ERROR (, ,)	D
Cause	The current nozzle number is not correct.	
Action	1. Check the current nozzle No. on the **TOOL DATA** screen to correct the erroneous setting (smaller than zero [0], or larger than the maximum permissible number [10]). 2. The nozzle check function (with a CCD camera) requires a nozzle to have been mounted on the torch. Mount a nozzle on the torch and change on the **TOOL DATA** screen the current nozzle No. from zero [0] to the appropriate number (not exceeding the maximum permissible number).	
1204	FOCUS DATA ERROR (, ,)	D
Cause	The focal length setting on the screen concerned is not correct.	
Action	The focal length setting (**Focus Act**) for that torch is not correct (larger than zero [0]) which is specified in an ATC command block with G22. Set the focal length correctly by automatic measurement (by blue flame detection) or manual measurement. Automatic measurement for focal length setting can be done by setting the parameter concerned (**L70**: enabling the blue flame detection) to one [1], if required, setting the focal length temporarily to zero [0], and executing the ATC command anew so as to resume the operation. (In this case, contact Mazak Technical Center or Technology Center beforehand to make sure that the adjustment for blue flame detection is complete.) Alternatively, measure the focal length manually, set the measured value of focal length on the screen concerned and then execute the ATC command anew.	
1205	MAGAZINE TOOL SELECT ERROR (, ,)	D
Cause	The tool selection command does not correspond to the current tooling state of the magazine. Tool selection from the magazine cannot be done correctly for the current argument T.	
Action	Check the argument T against the settings concerned on the **MAGAZINE DATA** screen.	

No.	Message	Clearing procedure
1206	TRACER CALIBRATION ERROR (, ,)	D
Cause	The Z-coordinate for tracer calibration is not correct.	
Action	Follow the procedure below to set the Z-coordinate for tracer calibration correctly: (1) Mount the torch and the nozzle on the head. (2) Perform movements on the XY-plane to the calibration position according to the machine type. - Standard machine (with 4 available torches): X = **J340**, Y = **J341**. - Machine with a magazine (for 20 torches): Refer to the **MAGAZINE DATA** screen. - HG612: Refer to the **TOOL DATA** screen. (3) Lower the head on the Z-axis by operating the pulse handle to bring the nozzle into contact with the calibration plate (until **AUTO GAP CONTROL ALARM** is displayed on the screen). (4) Read the Z-coordinate on the screen and set the reading in the following memory cell according to the machine type: - Standard machine (with 4 available torches): **J342** (Z-coordinate for tracer calibration). (In this case, contact Mazak Technical Center or Technology Center before modifying the parameter setting.) - Machine with a magazine (for 20 torches): **Calibration Z** on the **MAGAZINE DATA** screen. - HG612: **Calibration Z** on the **TOOL DATA** screen.	
1207	TRACER SKIP SIGNAL ERROR (, ,)	D
Cause	The input signal by touching the calibration plate has not been received appropriately during tracer calibration.	
Action	Take the following measures: 1. Clean the nozzle end, if contaminated, and execute the calibration anew, 2. Clean the calibration plate, if contaminated, and execute the calibration anew, and/or 3. Correct the nozzle mounting state, if required, and execute the calibration anew. If the above measures should be of no effect, contact Mazak Technical Center or Technology Center.	
1208	TRACER VOLTAGE ERROR (, ,)	D
Cause	The voltage for tracer calibration is not correct.	
Action	Take the following measures: 1. Clean the nozzle end, if contaminated, and execute the calibration anew, 2. Clean the calibration plate, if contaminated, and execute the calibration anew, and/or 3. Correct the nozzle mounting state, if required, and execute the calibration anew. If the above measures should be of no effect, contact Mazak Technical Center or Technology Center.	
1209	PARAMETER SETTING ERROR (, ,)	D
Cause	The parameter for setting the number of tracing voltage values to be detected is not correct.	
Action	Set the parameter concerned (**J460**) to 20 or less. Consult Mazak Technical Center or Technology Center as to whether and how to correct the parameter.	
1210	TOOL COMMAND DATA ERROR (, ,)	D
Cause	The ATC command with G22 results in the nozzle to have to be mounted without the torch having been selected correctly.	
Action	Check the torch registration data on the **TOOL DATA** screen to correct the argument T in the ATC command (G22 T_ Z_ W_) and then execute the ATC command anew.	

No.	Message	Clearing procedure
1211	COMMAND T DATA ERROR (, ,)	D
Cause	The argument T in an ATC command block with G22 is not correct.	
Action	1. Correct the erroneous torch number specified as an argument T (smaller than zero [0], or larger than the maximum number of available torches [4 and 6 for the standard machine and particularly for HG612, respectively, or 20 for machines with a magazine]). 2. Correct the erroneous lens size specified as an argument T (smaller than zero [0], or larger than the maximum permissible value [399]).	
1212	COMMAND Z DATA ERROR (, ,)	D
Cause	The argument Z in an ATC command block with G22 is not correct.	
Action	1. Correct the erroneous nozzle number specified as an argument Z (smaller than zero [0], or larger than the maximum permissible number [10]). 2. The torch mounted on the head cannot be returned to the torch holder directly without the nozzle having been removed. Return the nozzle beforehand (as required by G22Z0W0). 3. The tool change command for a laser torch must always be given in a format for mounting both torch and nozzle (G22T_Z_W_); a G22 command with torch designation only (G22T_) is inadmissible. 4. Correct the erroneous nozzle size specified as an argument Z (smaller than zero [0], or larger than the maximum permissible value [9.9]).	
1213	COMMAND W DATA ERROR (, ,)	D
Cause	The argument W in an ATC command block with G22 is not correct. A nozzle change command is given without argument W for specifying the nozzle type (single or double).	
Action	For the fast piercing nozzle, according as the required nozzle is a single or a double one, give a command of the format G22Z_W0 or G22Z_W1. For the slim nozzle of single type, give a command of the format G22Z_W2. A G22 command with an argument Z only (G22Z_) is not admissible.	
1214	COMMAND J THICKNESS ERROR (, ,)	D
Cause	Argument J (for specifying the plate thickness) in a G22 command is outside the setting range.	
Action	Correct the argument J. Setting range for argument J (plate thickness): $0 < J \leq 99$.	
1215	AUTO FOCUS OUT OF RANGE (, ,)	D
Cause	Argument U (for automatic focusing) in a G22 command is outside the setting range.	
Action	Correct the argument U. Setting range for argument U (for automatic focusing): Normal torch .....$-14 \leq U \leq 2$ mm, or $-0.551 \leq U \leq 0.078$ in Servo Focus torch.....$-19 \leq U \leq 5$ mm, or $-0.748 \leq U \leq 0.197$ in	
1216	MATERIAL ERROR (, ,)	D
Cause	Argument I (for specifying the material) in a G22 command is not adequate.	
Action	The MSCS (Mazak Safe Cut System) is only applicable to stainless steel. To use the MSCS, therefore, enter “I2” in a G22 command (G22I2). (I = 1: Steel, 2: Stainless steel, 3: Aluminum, 4: Bonderized steel, 5: Brass, 0: MSCS not used)	
1217	THICKNESS ERROR (, ,)	D
Cause	Argument J (for specifying the plate thickness) in a G22 command is not adequate.	
Action	1. The MSCS (Mazak Safe Cut System) is only applicable to a plate at least 8 mm or 0.315 in thick. To use the MSCS, therefore, enter a value equal to, or larger than, the above in a G22 command. 2. Argument J (for specifying the plate thickness) for tapping is outside the setting range. Correct the argument J.	

No.	Message	Clearing procedure
1218	COMMAND Z DATA ERROR (, ,)	D
Cause	Argument Z in a chamfering command is outside the setting range.	
Action	Correct the argument Z. Setting range for argument Z (offset Z): $-3 \leq Z \leq 3$.	
1219	MACRO CALL ERROR (, ,)	D
Cause	An argument in the macroprogram call command is not correct.	
Action	The argument T in an ATC command block with G22 is not correct. Check the torch registration data on the **MAGAZINE DATA** screen to correct the argument T in the ATC command with G22 and then execute the ATC command anew.	
1220	LASER DISCHARGE ON (, ,)	D
Cause	An ATC command with G22 is given under lasing condition.	
Action	Execute M23 (Lasing OFF) before the ATC command.	
1221	TRACE ON (, ,)	D
Cause	An ATC command with G22 is given under tracing condition.	
Action	Execute M31 (Tracing OFF) before the ATC command.	
1222	ASSIST GAS ON (, ,)	D
Cause	An ATC command with G22 is given under assisting-gas supplying condition.	
Action	Execute M09 (Assisting gas OFF) before the ATC command.	
1223	CLEAN LENS. (, ,)	D
Cause	Lens contamination has been detected by the corresponding detection function.	
Action	Clean the lens and then reset the focal length (**Focus Act**) to zero (0) on the **TOOL DATA** screen. The focal length will then be measured and registered on the **TOOL DATA** screen automatically by executing again the ATC command with G22 for the same laser torch.	
1224	CHANGE NOZZLE. (, ,)	D
Cause	The nozzle has been found to be abnormal by the nozzle check function (by CCD). The nozzle may be fouled with spatters or damaged (deformed).	
Action	Clean the nozzle and then return the status indication of the nozzle to “Enable” on the **TOOL DATA** screen (since the occurrence of this alarm will cause the nozzle in question to be disabled). The nozzle is to be replaced with a new one if the repeated execution of the same ATC command should cause the alarm again in spite of the cleaning.	
1225	TORCH IS NOT IN HOLDER (, ,)	D
Cause	The sensor for checking the presence of a torch in the torch holder is malfunctioning.	
Action	The sensor must be adjusted so that it may be turned on upon detection of a torch in the holder. Consult Mazak Technical Center or Technology Center as to how to adjust the sensor.	

No.	Message	Clearing procedure
1226	VALID TORCH IS NOT REGISTERED (, ,)	D
Cause	No corresponding torch registered is found to be effective (enabled).	
Action	Register the torch to be changed for by an ATC command (G22T_Z_W_) correctly on the **TOOL DATA** screen. Do not fail to select “Enable” under **Status** for that torch. When the torch has been automatically “disabled” by the function of detecting lens contamination, clean the lens and reset the focal length (**Focus Act**) to zero (0) on the **TOOL DATA** screen. The focal length will then be measured and registered on the **TOOL DATA** screen automatically by executing again the ATC command with G22 for the same laser torch.	
1227	VALID NOZZLE IS NOT REGISTERED (, ,)	D
Cause	No corresponding nozzle registered is found to be effective (enabled).	
Action	Register the nozzle to be changed for by an ATC command (G22T_Z_W_) correctly on the **TOOL DATA** screen. Do not fail to select “Enable” under **Status** for that nozzle. When the nozzle has been automatically “disabled” by the nozzle check function (by CCD), clean the nozzle and then return the status indication of the nozzle to “Enable”. The nozzle is to be replaced with a new one if the cleaning should be of no effect.	
1228	TORCH IS NOT IN HEAD (, ,)	D
Cause	The command for returning the torch to the holder is not executable since the head has no torch mounted. Or the command for mounting or returning the nozzle is not executable since the head has no torch mounted.	
Action	1. Mount the desired torch on the head, set the current torch number correctly on the **TOOL DATA** screen and then execute the ATC command anew so as to resume the operation. 2. If this alarm should occur in spite of presence of a torch on the head, then the sensor for checking the presence of a torch on the head is malfunctioning. Consult Mazak Technical Center or Technology Center as to how to adjust the sensor in question.	
1229	NOZZLE DOES NOT EXIST (, ,)	D
Cause	Nozzle mounting by an ATC command with G22 has failed. Or the nozzle check function is not executable since the current torch has no nozzle mounted.	
Action	1. Mount the desired nozzle on the torch and set the current nozzle number correctly on the **TOOL DATA** screen. 2. To use the nozzle check function, mount a nozzle beforehand by a G22 command.	
1230	NOZZLE EXIST (, ,)	D
Cause	Nozzle return by an ATC command with G22 has failed.	
Action	Execute the ATC command again to return the nozzle. In case a nozzle is to be mounted manually on the torch, do not fail to manually change on the **TOOL DATA** screen the current nozzle number as appropriate and, if required, the current head status to two [2].	
1231	TORCH IS IN HOLDER (, ,)	D
Cause	The holder to which the torch should be returned has another torch.	
Action	Check the torch number settings on the **TOOL DATA** screen against the corresponding settings for the torch holders. After the required data correction, execute the ATC command anew so as to resume the operation.	
1232	TORCH IS IN HEAD (, ,)	D
Cause	The command for mounting the torch is not executable since the head has another torch mounted.	
Action	Check the number of the torch currently mounted on the head against the indication of the current torch number on the **TOOL DATA** screen and then, after the required data correction, execute an ATC command with G22 beforehand to return the current torch to the torch holder.	

No.	Message	Clearing procedure
1233	TORCH IS NOT IN STATION (, ,)	D
Cause	The command for returning the torch holder at Station 1 or 2 into the magazine is not executable since the holder is currently empty.	
Action	Check the torch numbers for Station 1 and Station 2 on the **TOOL DATA** screen against the actual state at both stations. After the required data correction, execute the ATC command anew so as to resume the operation.	
1234	HOLDER IS NOT IN STATION (, ,)	D
Cause	The command for returning the torch to Station 1 or 2 is not executable since there is no torch holder provided at the station.	
Action	Set torch holders properly at Station 1 and Station 2 and execute the ATC command anew so as to resume the operation.	
1235	SAME TOOL IS IN HOLDER (, ,)	D
Cause	The torches at Station 1 and Station 2 do not differ from each other in the size of the lens. The tool registration on the **TOOL DATA** screen is erroneous.	
Action	Check the torch numbers for Station 1 and Station 2 on the **TOOL DATA** screen against the actual state at both stations. After the required data correction, execute the ATC command anew so as to resume the operation.	
1236	MAGAZINE NOT CORRECT POSITION (, ,)	D
Cause	Tool change between machine and magazine is no more possible since the magazine indexing state is abnormal.	
Action	Adjust the magazine indexing mechanism as required for normal indexing operation and execute the ATC command with G22 anew so as to resume the operation. Consult Mazak Technical Center or Technology Center as to how to perform the adjustment in question.	
1240	NOT CORRECT TOOL (, ,)	D
Cause	It is attempted to execute tracer calibration with a tap unit mounted on the head. Or it is attempted to execute the function for blue flame detection or lens contamination detection with an inadequate torch mounted on the head.	
Action	1. Tracer calibration is not applicable to the tap unit. Do not give a tracer calibration command (G22V1) in a program section for tapping. 2. The function for blue flame detection or lens contamination detection is only applicable to the torch with a lens of the size (in focal length) 3.75", 5", 7.5", 8.25", 8.5", or 8.75". Check the torch registration on the **TOOL DATA** screen.	
1241	NOT LASER TORCH (, ,)	D
Cause	Since it is not a laser torch, the current torch cannot be subject to blue flame detection.	
Action	To use the function for blue flame detection, mount a laser torch on the head and correct the current torch number accordingly on the **TOOL DATA** screen.	
1242	NOT SHAVER TORCH (, ,)	D
Cause	Since it is not a shaver torch, the current torch cannot execute the shaving function.	
Action	To use the shaving function, mount a shaver torch on the head and correct the current torch number accordingly on the **TOOL DATA** screen.	
1243	NOT CHAMFER TORCH (, ,)	D
Cause	Since it is not a chamfering torch, the current torch cannot execute the chamfering function.	
Action	To use the chamfering function, mount a chamfering torch on the head and correct the current torch number accordingly on the **TOOL DATA** screen.	

No.	Message	Clearing procedure
1244	NOT TAP TORCH (, ,)	D
Cause	Since it is not a tapping torch, the current torch cannot execute the tapping function.	
Action	To use the tapping function, mount a tapping torch on the head and correct the current torch number accordingly on the **TOOL DATA** screen.	
1250	UPPER BLUE FLAME ISN'T DETECTED (, ,)	D
Cause	The upper side of the blue flame cannot be detected.	
Action	Clean the lens as required and execute the function for blue flame detection again. Ask Mazak Technical Center or Technology Center to take appropriate measures (checking the lens position for appropriateness, adjusting the voltage for the blue flame sensor, adjusting the height of the plate, etc.) if the repeated execution should cause the alarm again in spite of the cleaning.	
1251	LOWER BLUE FLAME ISN'T DETECTED (, ,)	D
Cause	The lower side of the blue flame cannot be detected.	
Action	Clean the lens as required and execute the function for blue flame detection again. Ask Mazak Technical Center or Technology Center to take appropriate measures (checking the lens position for appropriateness, adjusting the voltage for the blue flame sensor, adjusting the height of the plate, changing the lasing conditions, etc.) if the repeated execution should cause the alarm again in spite of the cleaning.	
1252	BLUE FLAME IS NOT DETECTED (, ,)	D
Cause	The blue flame cannot be correctly detected.	
Action	Clean the lens as required and execute the function for blue flame detection again. Ask Mazak Technical Center or Technology Center to take appropriate measures (checking the lens position for appropriateness, adjusting the voltage for the blue flame sensor, adjusting the height of the plate, changing the lasing conditions, etc.) if the repeated execution should cause the alarm again in spite of the cleaning.	
1253	FOCUS IS OUT OF RANGE (, ,)	D
Cause	The focus obtained by the blue flame detection is outside the allowable range.	
Action	Clean the lens as required and execute the function for blue flame detection again. Ask Mazak Technical Center or Technology Center to take appropriate measures (checking the lens position for appropriateness, adjusting the voltage for the blue flame sensor, adjusting the height of the plate, changing the lasing conditions, etc.) if the repeated execution should cause the alarm again in spite of the cleaning.	
1254	AUTO FOCUS DIST. OUT OF RANGE (, ,)	D
Cause	The reference distance for the automatic focusing function (#998) is outside the setting range.	
Action	Correct the #998 setting. Setting range for the automatic focusing reference distance (#998): Normal torch .....–93 ≤ #998 ≤ –89 Servo Focus torch....–28 ≤ #998 ≤ –24	
1255	FOCUS LENGTH IS OUT OF RANGE (, ,)	D
Cause	The focal length (#999) is outside the setting range.	
Action	Correct the #999 setting. Setting range for the automatic focusing reference distance (#999): Normal torch .....–15.5 ≤ #999 ≤ 0 Servo Focus torch...–19 ≤ #999 ≤ 0	

No.	Message	Clearing procedure
1260	CHAMFER DROOP OVER (, ,)	D
Cause	The error during chamfering operation is excessively great. The chamfering tool may be worn significantly.	
Action	Replace the worn tool with a new one and resume the operation.	
1265	TAP COMMAND ERROR (, ,)	D
Cause	Argument Z (amount of offsetting along the Z-axis) in a tapping command is outside the setting range.	
Action	Correct the argument Z. Setting range for argument Z (offset Z): $-5 \leq Z \leq 5$.	
1266	TAP TOOL ERROR (, ,)	D
Cause	The tapping tool has been found to be broken by the corresponding detection function.	
Action	Replace the broken tool with a new one and resume the operation.	
1270	EDGE IS NOT DETECTED (, ,)	D
Cause	The coordinates of the workpiece corner cannot be detected correctly.	
Action	Set the X- and Y-coordinates of the detection starting position so that the distance of the starting position along the X- and Y-axis from the target corner position of the workpiece may not exceed 5 mm (0.20 in).	
1271	OUT OF ROTATION LIMIT (, ,)	D
Cause	The obliquity of the workpiece in the XY-plane is outside the allowable range.	
Action	Set the workpiece so that its obliquity in the XY-plane may be within the allowable range: 3° for 500 mm sketch plates or 0.5° for regular-size plates.	
1272	ROTATION COMMAND ERROR (, ,)	D
Cause	Argument I, J, K, A, or B in a G192 command is outside the setting range.	
Action	The admissible ranges of setting arguments I, J, K, A, and B are as follows: I : 75 mm (2.592 in) $\leq$ I $\leq$ 200 mm (7.874 in) J : 75 mm (2.592 in) $\leq$ J $\leq$ 200 mm (7.874 in) K: I < K < 90% of the workpiece size A: 0 (for sketch plates), 1 (for stand-alone machines), 2 (for machines in an FMS) B: 92, or 54 to 59	

14 CHART OF CONDITIONS WHEN TURNING ON THE POWER AND RESETTING

Item			When turning ON the power	Condition upon resetting
Setting data	Manual operation	JOG feedrate	×	○
		Handle multiplication, axis	○	○
		Laser condition	Becomes initial value	○
		Origin setting	Becomes initial value	○
	MDI	MDI program	×	○
	Automatic operation	Program No.	○	○
		Sequence No. (Search for restart)	×	×
		Machining time	○	○
		Scale	Becomes initial value	○
		Nozzle trace display	×	○
		Single block	○	○
		Block delete	○	○
		Optional stop	○	○
		Simulation	○	○
		M function lock	○	○
		Beam OFF	○	○
		Handle interruption multiplication, axis	○	○
	Common tool	Common tool data	○	○
	Parameter	Operation parameter	○	○
		User parameter	○	○
		Macro variable	○	○
	Machining conditions	Machining conditions data	○	○
Override		Feed override	Becomes initial value	○
		Rapid override	Becomes initial value	○
		Power override	Becomes initial value	○
		Frequency override	Becomes initial value	○
		Duty override	Becomes initial value	○
		Assist gas override	Becomes initial value	○
		Profiling offset	Becomes initial value	○
Other data		Programs in memory	○	○

○: Does not change, or continues the motion. ×: Cleared, or stopped

- NOTE -